Section F

Sustaining Our Common Future

Chapter 10 **From the Periphery to the Core of Decision Making – Options for Action**

While governments are expected to take the lead, other stakeholders are just as important to ensure success in achieving sustainable development. The need couldn't be more urgent and the time couldn't be more opportune, with our enhanced understanding of the challenges we face, to act now to safeguard our own survival and that of future generations.

Chapter 10

From the Periphery to the Core of Decision Making – Options for Action

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Main messages

We appear to be living in an era in which the severity of environmental problems is increasing faster than our policy responses. To avoid the threat of catastrophic consequences in the future, we need new policy approaches to change the direction and magnitude of drivers of environmental change and shift environmental policy making to the core of decision making. The main policy conclusions and messages of this chapter are:

Environmental problems can be mapped along a continuum from those where "proven" solutions are available to those where both the understanding of the problem and its solutions are still "emerging." For problems with proven solutions, the cause-and-effect relationships are well known, the scale tends to be local or national, impacts are highly visible and acute, and victims are easily identified. However, the emerging problems (also referred to as "persistent" environmental problems) are rooted in structural causes. Many of the same causes of these environmental problems simultaneously underpin entrenched poverty and over consumption. For these environmental problems, some of the basic science is known about cause-and-effect relationships, but often not enough to predict a point of no return. They often need global or regional responses. Examples include climate change, stratospheric ozone depletion, persistent organic pollutants and heavy metals, tropospheric ozone, acid rain, large-scale deterioration of fisheries, extinction of species, and alien invasive species.

Environmental policy has been successful in solving many environmental issues, especially where marketable technical solutions are available. Such policy success, however, needs to be continually extended, adapted and re-assessed, particularly in parts of the developing world, where many of the environmental problems effectively addressed elsewhere seriously threaten the well-being of billions of people.

The range of policies (the toolbox) for dealing with environmental issues has, in the past 20 years, become more sophisticated and diversified. There are many promising examples showing how this powerful toolbox can be deployed effectively. For instance, many governments have used command-and-control and market-based instruments to achieve environmental goals, community participation techniques to help manage natural resources, and technological advances to implement policy more effectively. Other actors, in the private sector and civil society, have formed innovative voluntary partnerships to contribute to achieving environmental goals.

Success in addressing environmental problems with proven solutions, however, will not solve "the urgent but complex problems bearing on our very survival" that the Brundtland Commission articulated. There is a set of environmental problems for which existing measures and institutional arrangements have systematically demonstrated inadequacies. Achieving significant improvements for a long period on these problems, which emerge from the complex interaction of biological, physical and social systems involving multiple economic sectors and broad segments of society, has been impossible and, for some, the damage may be irreversible.

The search for effective policy responses to these emerging environmental problems has recently focused on options to transform their drivers. Although environmental policy responses have typically focused primarily on reducing pressures, achieving particular environmental states or coping with impacts, policy debates are increasingly concerned with

how to address drivers, such as population and economic growth, resource consumption, globalization and social values.

Fortunately, the range of policy options to influence economic drivers is more advanced than at the time of the Brundtland Commission report, *Our Common Future*. These include the use of green taxes, creation of markets for ecosystem services and use of environmental accounting. The analytical foundation for such approaches has been refined, and governments are gaining experience in implementing them, although typically only at relatively small scales.

An organizational focus at all levels on these emerging environmental problems requires the shifting of the environment from the periphery to the core of decision making. The current role that the environment plays in governmental and intergovernmental organizations, and in the private sector could be made more central through structural changes, mainstreaming of environmental concerns into sectoral plans and a more holistic approach to development planning and implementation.

Regular monitoring of policy effectiveness is urgently needed to better understand strengths and weaknesses, and facilitate adaptive management. This infrastructure has not appreciably expanded in the past 20 years, even though policy goals have broadened considerably. Welfare cannot be measured by income only, and aggregate indicators have to take into account the use of natural capital as well. Of particular urgency is an improved scientific understanding of the potential turning points, beyond which reversibility is not assured.

For many problems, the benefits from early and ambitious action outweigh their costs. Both ex-post evaluations of the costs of ignoring warnings as well as the scenarios on the costs of global environmental change show that determined action now is cheaper than waiting for better solutions to emerge. In particular for climate change, our knowledge on the costs of inaction shows a worrying picture even while immediate measures are affordable.

Political decisions need support and legitimacy to be implemented. The knowledge basis for the environmental issues has expanded enormously during the last 20 years. Similarly, the range of options to influence social attitudes, values and knowledge has also expanded. Better environmental education programmes and awareness campaigns, and much more attention to involve various stakeholders will make environmental policies better rooted. An educated and more involved population will be more effective in addressing failures of government and holding institutions to account.

The new environmental policy agenda for the next 20 years and beyond has two tracks:

- **expanding and adapting proven policy approaches to the more conventional environmental problems, especially in lagging countries and regions; and**
- **urgently finding workable solutions for the emerging environmental problems before they reach irreversible turning points.**

Policy-makers now have access to a wide range of innovative approaches to deal with different types of environmental problems. There is an urgent need to make choices that prioritize sustainable development, and to proceed with global, regional, national and local action.

It is imperative for policy-makers to have the tools that help reduce the political risks of making the right decisions for the environment. The political fallout for making a rushed decision that is subsequently proven wrong can be politically damaging, especially if powerful political supporters are adversely affected.

INTRODUCTION

In the two decades since the World Commission on Environment and Development (Brundtland Commission) described a set of "urgent but complex problems bearing on our very survival" (WCED 1987), the global concern over environment and development issues has expanded. However, clear solutions and institutional mechanisms remain poorly defined. The problems identified by the commission have grown more severe, and new problems that were not foreseen have arisen. The main environmental problems described in previous chapters of this report can be categorized along a continuum – from those where "proven" solutions are available, to those where both the understanding of the problem and solutions are still "emerging" (see Figure 10.1).

"Since the answers to fundamental and serious concerns are not at hand, there is no alternative but to keep on trying to find them."

Our Common Future

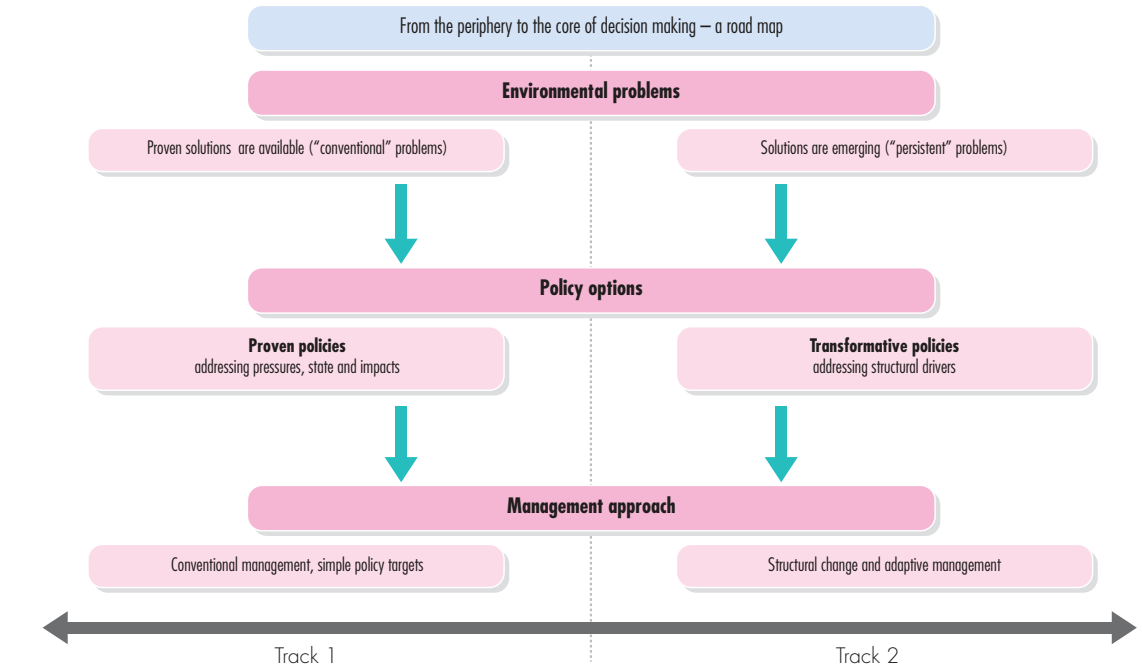
Problems at the latter end of the continuum share a number of characteristics that make them hard to manage, including complex interactions across global, regional and local scales, long-term dynamics, and multiple stressors and stakeholders (see Chapter 1). Many of these hard to manage problems can be termed "persistent" environmental problems (Jänicke and Volkery 2001). Unfortunately, policy making and institutional reforms remain anchored in the less complex, more manageable environmental challenges of the 1970s, and have not kept pace with the emergence of these persistent environmental problems.

An inventory of environmental policy goals and targets, a review of experience in managing cross-cutting issues, an assessment of the adequacy of multilateral environmental agreements (MEAs), along with the scenario policy analyses in Chapter 9, underpin this review. Evidence shows that there is an urgent need to address the types of environmental problems that may have irreversible consequences, which may make local, regional, or even global environments progressively uninhabitable.

The future policy options point to the need for a two-track approach:

- expanding and adapting proven policy approaches to the more conventional environmental problems, especially in lagging countries and regions; and
- urgently finding workable solutions for the emerging environmental problems before they reach irreversible turning points.

Figure 10.1 Two tracks to address environmental problems with proven and emerging solutions



Note: Over time, both tracks are expected to merge (as discussed on the next page).

Over time, both tracks are expected to merge into one, as the environmental policy agenda is progressively moved from the periphery to the core of economic and social development decision making.

For the first track, management and institutional approaches can learn from successful application of environmental policies in other parts of the world. The second track involves dealing with emerging environmental problems, and creating new institutional arrangements based on adaptive management, finding innovative financing mechanisms and improving monitoring, evaluation and social learning. Both tracks, however, need greater focus to address underlying societal and cultural values, increased education, empowerment of citizens and decentralized governance structures.

CURRENT ENVIRONMENTAL POLICY RESPONSES

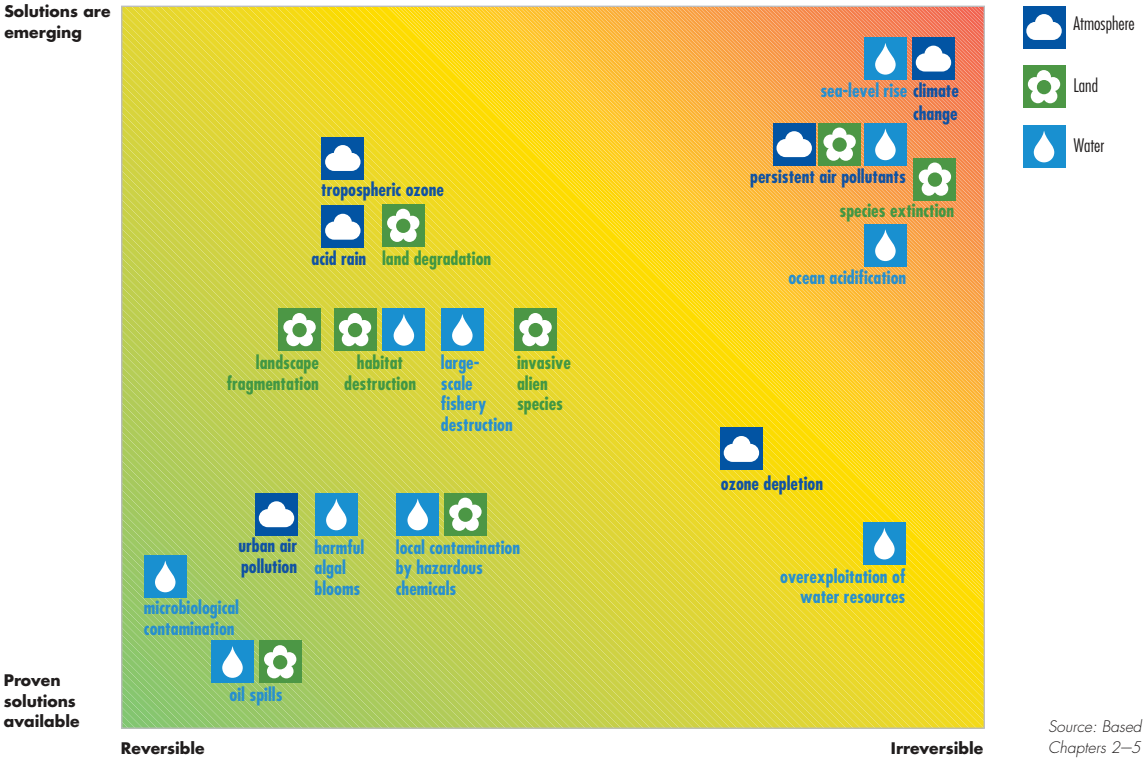
Management of environmental problems

Environmental problems appear as impacts on nature and human well-being, through the air and atmosphere, in fresh and marine water, and on land. Most aspects of these environmental problems are described in the previous chapters. Eighteen of the key environmental issues discussed in Chapters 2–5 have been organized to illustrate the difficulty of management, and the extent to which the problems can be seen as having reversible or irreversible consequences, making local, regional or even global environments progressively uninhabitable (see Figure 10.2). While it is recognized that other dimensions could be used, *GEO-4* has organized the environmental problems in two main clusters along a continuum.

Problems with proven solutions

The cause-and-effect relationships are well known, single sources generally can be identified, the potential victims are often close to those sources and the scale is local or national. Good examples of success stories for solving these environmental problems are available for microbial contamination, harmful local algal blooms, emissions of sulphur, nitrogen oxides, particulate matter, oil spills, local

Figure 10.2 Mapping environmental problems according to management and reversibility



Source: Based on Chapters 2–5

land degradation, localized habitat destruction, fragmentation of land, and overexploitation of freshwater resources.

Problems with emerging solutions

Some of the basic science about cause-and-effect relationships is known, but often not enough to predict when a turning point or a point of no return will be reached, or exactly how human well-being will be affected. The sources of the problem are quite diffuse and often multisectoral, potential victims are often quite remote from the sources, extremely complex multi-scale ecological processes may be involved, there may be a long time between causes and impacts, and there is a need to implement measures on a very large scale (usually global or regional). Examples include global climate change, stratospheric ozone depletion, persistent organic pollutants and heavy metals, extinction of species, ocean acidification, and introduction of invasive alien species.

The environmental problems at the "emerging solutions" end of the continuum have implications for development, in two fundamental ways:

- Environmental resources and change create direct opportunities and threats for development (Bass 2006). Natural capital frequently constitutes economically important assets, the management of which has a strong impact on economic growth (Costanza and Daly 1992). Poor countries generally have a higher percentage of their total assets comprised of environmental resources than produced capital (World Bank 2006). Environmental resources frequently affect risk exposures, by mediating or altering natural hazard vulnerability. They frequently play an important role in empowerment of vulnerable social groups, including women; marginalized ethnic, linguistic or regional populations; and the extremely poor. Environmental resources can also play a strong role in shaping the long-term viability of economic development strategies.
- The diagnosis of the causes of persistent environmental problems shares much in common with similar diagnoses of persistent development problems. In particular, the large gap between proven governance mechanisms and the magnitude and complexity of environmental problems is similarly found in areas where development is lagging.

Therefore, there are strong reasons for coordinating the environment and development agendas. This message is implicit behind the overarching design of major international processes, such as Agenda 21 and the Johannesburg Plan of Implementation, but a major gap remains between both the environment and development agendas (Navarro and others 2005).

The cluster of large-scale, persistent environmental problems has more complex interlinkages, and it is more difficult to get concerted effort at multiple scales to solve the intertwined problems (see Chapter 8). As the Brundtland Commission stated, they are often part of "the downward spiral of linked ecological and economic decline in which many of the poorest nations are trapped" (WCED 1987).

Success stories for solving these kinds of environmental problems are much less common than for the environmental issues identified in the 1970s. In addition, left unattended or uncontrolled, many issues in the first cluster can coalesce and contribute to the persistent problems. For example, expanding local land degradation (see Chapter 3) may result in dust and sandstorms at the regional scale, contributing to atmospheric brown clouds that contribute to global dimming (reduced solar radiation reaching the ground) and impacts on regional monsoons (see Chapter 2).

Elevating environment on the policy agenda

At all points on the continuum, there are significant challenges involved in raising the profile of environmental issues in public policy, but the opportunities are also numerous. Elevating the profile of environmental issues in public policy might involve the following actions.

Raising the profile of the environmental agenda

Although sustainable development has gained general political support, environment remains low on the policy agenda in most day-to-day politics. Poverty reduction, economic growth, security, education and health are clearly the highest priority policy items. Proving that the environment underpins and contributes significantly to all of these high priority issues can raise its political visibility, leading to more political support (Diekmann and Franzen 1999, Carter 2001).

Strengthening integration

Traditionally, environmental policy-makers have not focused on establishing linkages with other

important policy agendas, such as poverty reduction, health and security in developing countries, or with economic sectors in developed countries. Phasing out environmentally damaging subsidies may, for instance, release funds for more targeted support for the poor, as well as improve the environment. Integrating environmental policy into other policy areas involves a continuous, adaptive process. End-of-pipe pollution controls in the 1970s led to cleaner production processes in the 1980s and zero-waste factories in the 1990s. Modern environmental policy and legislation needs to follow a similar, stepwise evolutionary path to finding and applying solutions for persistent environmental problems (EEA 2004, EEB 2005).

Setting clear goals and targets, and strengthening monitoring

Political commitments to specific goals and targets are essential to effectively address environmental issues. Developments in this area are often only visible over the medium- to long-term, and tend to escape day-to-day political attention. Therefore, scientific research and monitoring, and information systems need to be maintained at adequate levels, and progress against benchmarks regularly reviewed by an independent body (OECD 2000). The lack of quantifiable targets for Millennium Development Goal (MDG) 7 on environmental sustainability has been one factor in its relatively low profile on the global agenda (UNDP 2005). The need to revisit time-bound targets under MDG 7 would be strategic in strengthening monitoring and accountability.

Reinforcing stakeholder involvement

A participatory approach facilitates collaborative efforts among various stakeholders, engenders a sense of ownership and makes new initiatives more sustainable. An informed population is also more effective in addressing failures of governments, enhancing transparency and holding institutions accountable. Although stakeholder participation often requires additional upfront costs in terms of time and resources it has, particularly at the local level, proven to be a successful instrument and may ultimately result in reduced costs (Eden 1996). However, in many countries and at the international level, the formal right to take part in the decision making process often remains restricted.

Building on small-scale successes

For internationally funded projects and initiatives, the scale of operation is proportional to funds available. Therefore, many environmental initiatives have not been scaled up to the extent where real environmental change may take place (UNESCO 2005a). Once the scale of an environmental problem goes beyond national borders, it is much harder to justify allocating national budgets or bilateral development assistance, creating potential free-rider problems.

Clarifying the role of government

Frequently, environmental ministries are seen as acting more like facilitators than implementers: steering not rowing. Priority could be given to the development

Economic activity is interlinked to land, water, and the atmosphere and environmental policy making must, therefore, involve the integration of all these aspects.

Credit: Ngoma Photos

of more effective policies and policy coherence. Environmental ministries could concentrate more on translating environmental aims and the results of research and monitoring into long-term objectives, priorities, basic legislation and mandatory limits. They should also be charged with reviewing the environmental results for each sector. In turn, sectoral departments need to build the necessary capacity to interpret and internalize environmental priorities into their policies, and take greater responsibility for implementing environmental activities. In some countries, restructuring has already taken place, and environmental units can now be found in the sectoral ministries, although loyalty may remain with sectoral interests (Wilkinson 1997).

Avoiding over-sophisticated legislation

In developed countries, incremental modifications of environmental regulations and lack of involvement of regulatory practitioners in this process make some legislation almost incomprehensible. Room for corruption has been enlarged, and an unnecessary burden has been imposed on industry. When these policy instruments are transferred to developing countries, which often have inadequate capacity to develop innovative, home-grown policies, the excessive level of sophistication makes them impossible to implement. Much clearer and more cost-effective regulations can be set up, drawing, whenever possible, upon capacities of other stakeholders (Cunningham and Grabosky 1998). Ideally, investing in capacity building, and supporting inclusive national legislative development processes will prove more beneficial in the long run.

Tackling hard choices

Many situations exist today where "win-win" solutions are impossible. Objective assessments, backed by freely accessible, high-quality information and public consultation, are needed to weigh trade-offs between potential alternatives. Economic valuation of non-market environmental goods-and-services, and consideration of potential social impacts need to be included in any objective evaluation of alternatives. Political leadership is essential. Delaying decisions may result in needless damage and death (EEA 2001), as well as possible irreversible change for which no trade-offs should be contemplated.

Critical policy gaps and implementation challenges

Successes tempered by policy gaps

The linear, single-source, single medium environmental problems that dominated the agenda at the 1972 Stockholm conference were, for the most part, subjected to increasingly effective management over the following two decades. Environmental ministries were created, national legislation governing air and water quality was implemented, and standards for exposure to toxic chemicals were adopted. Based on the analyses in Chapters 2–8, it can be concluded that nearly all countries now have a set of policy instruments, if not an explicit environmental policy, which provides a platform for improved environmental management (Jordan and others 2003). There is also support for projects and innovative experiments to enhance the capacities of personnel and promote better environmental management in most developing countries.

Considerable effort has been invested in new approaches to environmental policy making (Tews and others 2003). Although there were failures, and many good policies were not implemented, due to institutional constraints, progress has been sustained and significant in a large number of countries. In some urban areas, environmental quality is better today than in the mid-1980s. The main policy gap is in ensuring that policies and organizational arrangements that have worked in some areas are sustained and extended to all (especially developing) countries. While there is an unfinished agenda that affects the well-being of billions of people, the necessary resources and political will to provide the enabling environment are still too often neglected.

Complex problems remain a major policy challenge

By contrast, the complex, multi-source, persistent environmental problems highlighted by the Brundtland Commission, and those that have emerged since have not been effectively managed anywhere (OECD 2001a, Jänicke and Volkery 2001, EEA 2002, Speth 2004). There are no major issues raised in *Our Common Future* for which the foreseeable trends are favourable. Apart from the obvious need to mainstream these problems into national decision making processes, workable policies for dealing with issues that require fundamental transformations in modern societies have yet to emerge.

Despite positive trends observed in some countries, the global environment remains under severe threat, and important ecosystems and environmental functions may be approaching turning points, beyond which the consequences could be disastrous (as shown in earlier chapters of this report). Therefore, there is an urgent need to reinvigorate the environmental dimension of

Box 10.1 Overview of global policy targets

As part of this assessment, policy targets associated with the high-priority global environmental problems analysed in Chapters 2–5 were identified and characterized. Global targets were the primary focus, but sub-global targets that covered large numbers of countries were also analysed.

At the level of *objectives*, or general statements of principle, the global community has articulated clear objectives fairly consistently across all the high-priority problems. However, when it comes to *targets*, or specific, quantifiable, time-bound outcomes, the situation is more uneven. For the most challenging problems, characterized by many of the dimensions of persistence, targets are less common, whereas they are more prevalent among the problems characterized as having proven solutions available. In terms of water, for example, clear targets exist concerning access to piped water and basic sanitation, which are linked to the broader objective of reducing the most pressing aspects of poverty. By contrast, although the objective of integrated watershed management is almost equally widespread, targets concerning how to implement it are rarer. There are clear, widespread targets already embedded in decision making concerning urban air pollution, but this is not the case for indoor air pollution.

The degree to which policy targets are supported by monitoring and evaluation procedures varies considerably. For ozone depletion, for example, there is a robust monitoring programme that measures the atmospheric concentration of ozone-depleting substances, ozone layer thickness, and trends in production, consumption and emissions. By contrast, most of the biodiversity protection targets lack baseline benchmarks and the kind of regular monitoring that would permit tracking of trends.

Most targets aim at improving generic capacities (including adoption of plans, creation of policy frameworks, conducting assessments and setting priorities), or at reducing pressures (lowering emissions, extraction or conversion). It is rarer to find targets that aim at reducing drivers or at achieving specific states. There are some biodiversity targets that target drivers, but none exist in other areas. Regional air pollution in Europe is the best-developed example of a targeting process that focuses on environmental states (in this case, levels of deposition relative to critical loads).

Figure 10.3 Global and regional targets and monitoring programmes

Issue	Targets	Monitoring
Biodiversity loss		
Climate change		
Degradation and loss of forests		
Indoor air pollution		
Integrated Water Resources Management (IWRM)		
Land contamination and pollution		
Land degradation/desertification		
Large-scale marine fisheries		
Long-range air pollution		
POPs		
Stratospheric ozone protection		
Water and sanitation		
Water security		

Targets	Monitoring
■ No targets ■ Quantitative, time-bound targets; not legally binding ■ Legally-binding, quantitative, time-bound targets *Exception: Long-range air pollution assigned yellow; legally-binding targets in Europe only*	■ No regular monitoring ■ Some monitoring takes place, but is less than complete ■ Relevant monitoring taking place globally

Source: Chapters 2–5, review of MEAs at Ecolex 2007, UN 2002a

development, to set realistic goals and targets (see Box 10.1), and to ensure that environmental goals and requirements are integrated into mainstream public policy at global, regional and national levels.

Policy implications of scenarios

The scenarios highlighted in Chapter 9 illustrate the difficulties of responding to persistent environmental problems, and of rapidly changing directions. The environmental implications of the various scenarios illustrate the legacy of past decades and the level of effort required to reverse powerful trends. One of the major policy lessons from the scenarios is that there can be significant delays between changes in human behaviour, including policy choices, and their environmental impacts, specifically:

- much of the environmental change that will occur over the next 50 years has already been set in motion by past and current actions (see also De-Shalit 1995); and
- many of the effects of environmentally relevant policies put into place over the next 50 years will not be apparent until long afterwards. The slow recovery of the ozone "hole" over Antarctica reflects this extended time dimension.

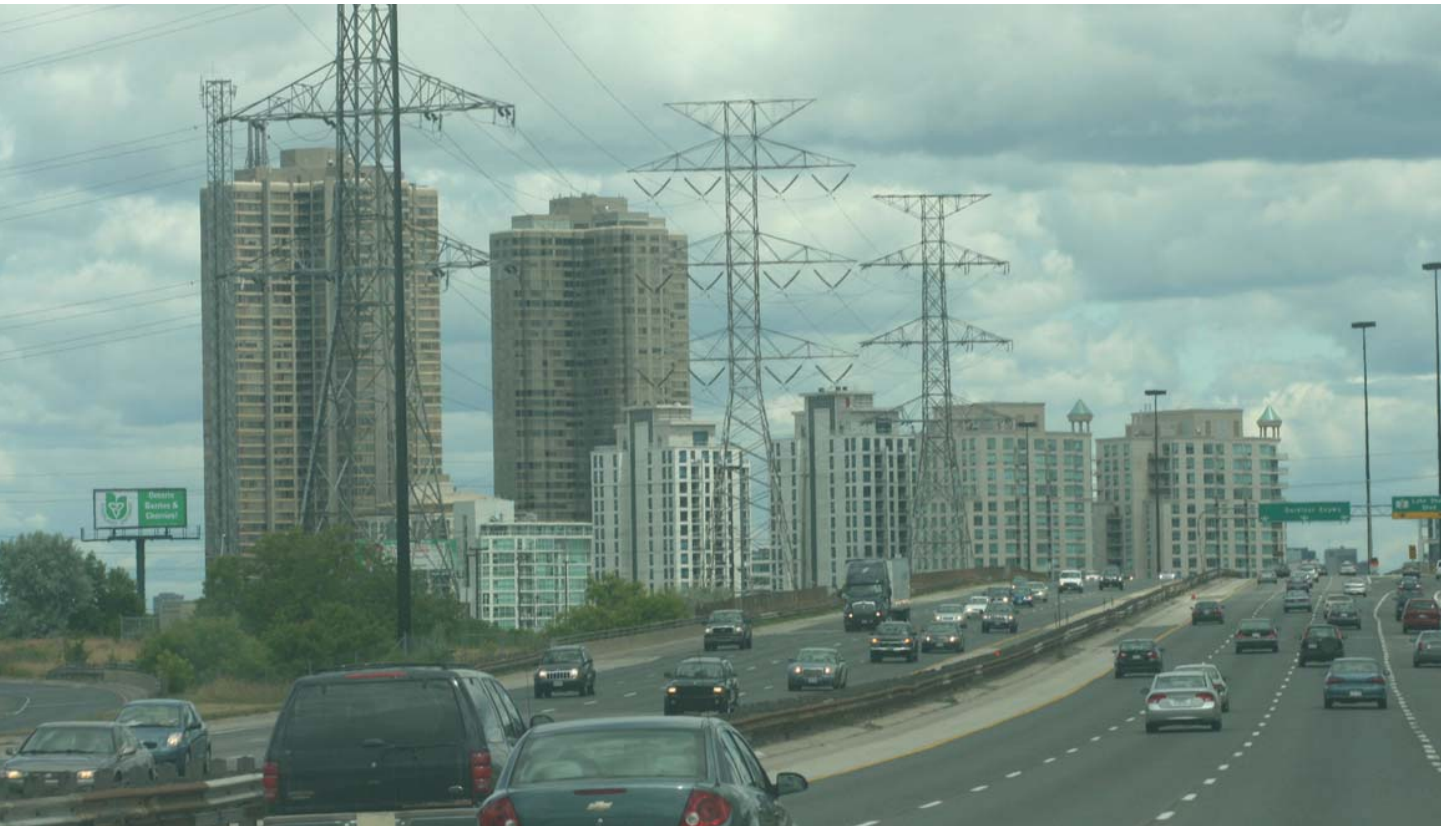
Enormous momentum is built into global economic systems, and many social forces are comfortable with (or profit from) the way the world is today. Combined with the lack of certainty over precisely when ecosystems may pass turning points, it is understandable that shifting trajectories in a deliberative, precautionary manner towards sustainability is so difficult. Nevertheless, the scenarios show:

- the very different outcomes if critical choices are not made in time; and
- the chance to avert global collapse exists if the right choices are made sooner rather than later.

A critical uncertainty in such scenarios is the ability to decouple pollution intensity from economic growth, and to shift towards service industries without lessening economic growth rates (Popper and others 2005).

Implementation challenges

Implementation of good practices needs to be extended to countries that have been unable to keep pace, due to lack of capacity, inadequate finances, neglect or socio-political circumstances. Due to internal or international pressures, most countries have already adopted some policies to address the environmental



Energy use and transport drive industrialization and urbanization. Many countries are now implementing policies to reduce inefficient use of energy, although change can be slow.

Credit: Ngoma Photos

issues with proven solutions. Implementation of these policies, however, remains relatively weak or non-existent in many developing countries. In some cases, it appears as if there is no real intention of implementing the policies, and governments are paying mere lip service to environmental management to pacify lobby groups or donors (Brenton 1994).

In too many countries, environmental policy remains secondary to economic growth. Generally, macro-economic objectives and structural reform have been considered of higher priority than environmental quality. Nowhere has it been possible to integrate economic, ecological and social objectives consistently with a sustainable development model (Swanson and others 2004). Increasing global concerns, such as poverty and security, may even have moved environmental issues further towards the periphery of the political agenda (Stanley Foundation 2004, UN 2005d).

Elevating the agenda to tackle persistent environmental problems impinging on the structural core of societies poses implementation challenges that appear immense. While there are a few examples of countries that have made successful structural changes, worryingly, some countries are even backsliding in implementation of the conventional environmental agenda (Kennedy 2004).

Implementation of environmental policies requiring substantial societal or cultural changes, such as a culture of environmental protection, or structural realignment, will meet with fierce resistance from sectors affected and from some parts of the public. Therefore, governments tend to buy time or defer decisions when such "hard" structural changes in overall policies are required – often until they are inevitable (New Economics Foundation 2006). Hard choices are usually found where the environment and economy intersect or interact, posing structural issues that are difficult to address. The underlying drivers are more entrenched, cross-cutting social and economic problems, with the environment deeply embedded in them.

How important these changes are viewed and how serious governments are about making changes often depend on political ideology and value orientation. To implement such "hard" options, governments have limited opportunities to take a close look at precedents and experience before embarking on them. Often, consideration of social and political costs rather than the lack of funds hinder implementation (Kennedy 2004). For example, removal of agricultural subsidies may have important environmental outcomes, but the political ramifications for making such changes are immense (CEC 2003). Policies designed to yield reduced carbon emissions affect all sectors that use energy. Hence, sectoral agencies and affected stakeholders need to "buy into" environmental policies (NEPP2 1994).

The policies that are easiest to implement are those that do not involve redistribution of wealth or power – often termed "win-win" situations or "soft" options. Many soft options are already being used, such as generating public awareness, setting up organizations, formulating symbolic national legislation and signing weak international conventions. These often create the appearance of action without really tackling the core drivers of the persistent environmental problems.

Although some policy debates are beginning to draw attention to drivers as appropriate focal points for policy intervention (Wiedmann and others 2006, Worldwatch Institute 2004), their representation in global policy fora is in its infancy. In a systematic identification of all global policy targets pertaining to the high priority environmental problems identified in previous chapters, only 2 out of 325 distinct policy targets were aimed at drivers (see Box 10.1). The majority targeted pressures and improvements in coping capacity. The exceptions were targets aimed at promoting sustainable consumption of natural resources in the biodiversity and forest conservation policy areas.

Existing environmental organizations were often not designed to address complex cross-sectoral and transboundary policy implementation. Institutions have been unable to keep up with the fast pace at which economic growth is generating cumulative environmental degradation. As pointed out in the Brundtland Commission report, a holistic approach requires the integration of environmental concerns and measures across all sectors. As persistent environmental problems also affect countries across borders, and become sub-regional, regional or global problems as evident in Chapter 6, coordination and harmonization of implementation approaches raise new organizational challenges.

Improved knowledge management is critical for effective implementation of policies. Although some information regarding these persistent environmental

issues is available, it is usually incomplete, and fails to bridge the gap between the technical measures observed and the human impacts that motivate policy-makers. They need clearly and easily understood frameworks, simple metrics and appropriate solutions to act upon. The scientific and academic community communicates the dimensions of such problems to policy-makers, using complex and incomplete measuring tools. While it is relatively easy to provide data on many of the most pressing economic and social outcomes, such as GDP and the Human Development Index, no equivalent concrete measuring tools have been broadly accepted in the environmental domain, although there are several competing options. One review found 23 alternative aggregate environmental indices (OECD 2002a), and several more are under development.

Supporting valuation and measurement initiatives that build up a common platform of understanding of the impact of policies on sustainability, and clearly measure the environmental consequences of economic actions will assist sensible decision making. Consensus on valuation is important, because not all environmental goods-and-services can or should be monetized. Non-monetary valuation indicators that are commonly understood and agreed upon, in conjunction with financial and social indicators, can show the status and trends towards or away from sustainability.

THE FUTURE POLICY FRAMEWORK

A strategic approach

Environmental policy has been successful in solving a wide array of linear, single source, single medium or "conventional" environmental issues, especially where marketable technical solutions have been available, such as chemical replacements for ozone-depleting substances (Hahn and Stavins 1992). However, persistent environmental problems, such as the rising concentrations of greenhouse gases, the loss of biodiversity, the accumulated contamination of soil and groundwater, and the cumulative effects of dangerous chemicals on human health, are issues where it has been impossible to achieve significant improvements for a long period of time and, for some, the damage may be irreversible (OECD 2001a, Jänicke and Volkery 2001, EEA 2002). Failure to effectively address these persistent problems will undermine or negate all of the impressive achievements in finding solutions to the conventional problems.

Therefore, a two-track strategy is envisaged: adapting and expanding the reach of proven policies, and developing policies to deliver more deeply rooted and structural change at all levels.

Expanding the reach of proven policies

Although a plethora of environmental challenges exist, there are also some effective policies available. Proven successes in environmental policy in other countries can be taken as an encouraging sign in those lagging countries beginning to face up to their own legacy of environmental degradation. Effective policies enhance a particular ecosystem service, and contribute to human well-being without significantly harming other ecosystem services or harming other social groups (UNEP 2006b). Promising responses either do not have a long track record, and thus outcomes are not yet clear, or could become more effective if they were adequately modified. Problematic responses do not meet their goals or harm other ecosystem services or social groups.

Since 1987, the policy landscape has expanded enormously and direct and indirect environmental policies now impinge on virtually all areas of

Table 10.1 Classification of environmental policy instruments

Command-and-control regulations	Direct provision by governments	Engaging the public and the private sectors	Using markets	Creating markets
■ Standards ■ Bans ■ Permits and quotas ■ Zoning ■ Liability ■ Legal redress ■ Flexible regulation	■ Environmental infrastructure ■ Eco-industrial zones or parks ■ National parks, protected areas and recreation facilities ■ Ecosystem rehabilitation	■ Public participation ■ Decentralization ■ Information disclosure ■ Eco-labelling ■ Voluntary agreements ■ Public-private partnerships	■ Removing perverse subsidies ■ Environmental taxes and charges ■ User charges ■ Deposit-refund systems ■ Targeted subsidies ■ Self-monitoring (such as ISO 14000)	■ Property rights ■ Tradeable permits and rights ■ Offset programmes ■ Green procurement ■ Environmental investment funds ■ Seed funds and incentives ■ Payment for ecosystem services

To avoid market distortion between competing industries, or globalization-driven pollution havens, internationally agreed standards need to be developed and cautiously applied.

Credit: Ngoma Photos

economic activity (Jänicke 2006). One of many categorizations of environmental policies is provided in Table 10.1. The progressive evolution of policies from "command-and-control" to "creating markets" over the past two decades is illustrated in this classification.

The toolbox of policy instruments has been gradually expanded, with much more emphasis on economic instruments, information, communication, and voluntary approaches (Tews and others 2003). These developments are partly related to the fact that the policy focus in the area of pollution control has shifted from the large single polluters (point sources) to more diffuse sources, that can be harder to control (Shortle and others 1998). However, direct regulation (also known as command-and-control) still plays a major role, and is likely to do so in the future (Jaffe and others 2002). Some governments have begun to reform their environmental standards in favour of more ambitious, innovation-friendly systems. For example, the Japanese Top Runner Program on energy efficiency is receiving much attention. In this programme, standards are adapted to the best available technologies, giving a continuous incentive to improve such standards.

Governments will need to continue applying (or threatening to apply) "strong instruments," such as command-and-control regulations, for effective policy implementation, even if the use of market forces and "soft instruments," such as provision of information, play a more important part than before (Cunningham and Grabosky 1998). An effective toolbox, therefore, has to include a wide variety of instruments, often used in concert, customised to the institutional, social and cultural milieu of the country or region concerned.

The challenge is to find the most efficient policy instrument or mix of instruments for a particular environmental problem in a particular geographic and cultural context. Increasingly, policy-makers are looking at complex models of social, economic and environmental systems to guide policy choices. However, these models themselves are inevitably partial representations of reality. For a number of environmental problems, direct command-and-control regulation will be an effective instrument, and this is therefore widely used today (see Box 10.2). In particular, the instrument is now used far more effectively to specify expected results rather than technical methods. Further, widely agreed technical standards, prescribed by law, may contribute to fair competition in the industry concerned, and also serve as an incentive for gradual technical development and innovation, improving environmental protection. In order to avoid market distortion between competing industries, or globalization-driven pollution havens, internationally agreed standards need to be developed and

Box 10.2 Flexible use of policy instruments in Norway

An example of innovative and flexible use of policy instruments involving multiple stakeholders is Norway's regulation on scrapped electrical and electronic products (under the Pollution Control Act and the Product Control Act). An increasing share of the solid waste stream is from the information and communication technology (ICT) sector, with a high content of hazardous materials, such as heavy metals. This waste source is also driving the WEEE (Waste Electric and Electronic Equipment) and RoHS (Restriction of Hazardous Substances) directives of the European Union.

The Norwegian approach involved relevant producers, importers and distributors in a review of the problem from the start, with a scoping study of the volume of such waste and its environmental implications, and a discussion of various means to deal with it. This led to a realization that there was a larger volume of waste than had originally been envisaged, and a proposal from the authorities for new regulations taking effect from 1 July 1999, after wide-ranging public consultation.

Parallel to this regulation, the environmental authorities and the main firms and business associations developed agreements, with fixed dates, commitments and reporting mechanisms, for implementation. These agreements are "voluntary," as firms are free to stay outside or enter into separate agreements (and therefore do not represent a competition issue or a "barrier to entry"), but they are grounded in the regulation, and avoid the "free rider" problem, as well as solving the compliance, control and enforcement issues of concern to business and the authorities.

The agreements involve setting up three waste collection companies by business, for different WEEE waste fractions, and collection of fees to finance the waste collection and treatment systems. The fees are administered by the business partners (collected along with the VAT system, to ensure low administrative costs). Following the introduction of the new policy instruments in 1999, the government in 2005 reported to Parliament that in 2004 "more than 90 per cent" of the total quantity of scrapped electrical and electronic products were collected. Further, the greatest part of the waste collected was recycled, and the hazardous waste components were managed in an environmentally sound manner. This apparently old-fashioned command-and-control instrument has been transformed, in cooperation with the relevant business sectors, and is administered to a large extent through contractual agreements, leaving implementation to the business sector.

Source: Ministry of Environment Norway 2005

cautiously applied. While waiting for global action, groups of importers in some markets have already started to set voluntary standards for their own production and supply chains.

A wide range of success factors have been demonstrated as important in best practice policies. Some of the key factors include (Dalal-Clayton and Bass 2002, Volkery and others 2006, Lafferty 2002, OECD 2002b):

- solid research or science underpinning the policy;
- high level of political will, usually bipartisan and therefore sustained;
- multistakeholder involvement, often through formal or informal partnerships;
- willingness to engage in dialogue with policy opponents;
- robust systems for mediating conflict;
- capable, trained staff engaged in implementation;
- prior systems of monitoring and policy revision agreed, including clauses that mandate periodic revision;
- legislative backing, combined with an active environmental judiciary;
- sustainable financing systems, ring-fenced from corruption;
- evaluation and assessment of policies independent from the rulemaking agent, for example, by advisory committees or public auditors;
- minimal delays between policy decisions and implementation; and
- coherence and lack of conflict throughout all government policies.

Finding new, transformative policies

The class of environmental problems still seeking solutions needs innovative policies to address survival or threshold issues. They will challenge existing societal structures, consumption and production patterns, economies, power relationships, and the distribution of wealth (Diamond 2005, Leakey and Lewin 1995, Rees 2003, Speth 2004). There is an urgent need for a fundamental reorientation of public and private policies on environmental issues, and for transformative structural changes (Gelbspan 1997, Lubchenco 1998, Posner 2005, Ehrlich and Ehrlich 2004).

Unfortunately, lack of political will has failed to make environment central to a government's mission (De-Shalit 2000). Modern politics can be characterized as a continuous negotiation among politicians and special interests to get attention for their issues and interests (where the strongest interest often wins). This creates a chaotic situation that can easily focus on short-term, politically expedient gains, rather than long-term sustainable and equitable development (Aidt 1998). As long as politicians and citizens fail

to recognize that human well-being depends on a healthy environment, and put issues other than environment among their top priorities, environmental policy-makers can only hope that other policies, such as economic, trade or development policies, will not make the environmental situation worse. Many of the persistent problems are slow to form, initially "invisible," difficult to pin down precisely and inadequately weighted when trade-offs are being considered, failing to get the attention of politicians with short-term horizons (Lehman and Keigwin 1992). However, the political fallout for making a rushed decision that is subsequently proven wrong can be politically damaging, especially if powerful political supporters are adversely affected (UCS 1992, Meadows and others 2004). It is, therefore, imperative for policy-makers to be provided with the tools that help reduce the political risks of making the right decisions for the environment.

For some persistent environmental problems, such as climate change and biodiversity loss, incentives for further environmental degradation are still being promoted, as these are primarily determined by other policy domains and their respective competing objectives (Gelbspan 1997, Wilson 1996, Myers 1997). Despite best intentions, implementation of international environmental agreements by national governments to address such issues is failing, and there are few, if any, sanctions for such failure (Caldwell 1996, Speth 2004).

Environmental policy failures are closely related to the challenge of a more encompassing integration of environmental concerns into other policy sectors (Giddings and others 2002). As environmental issues have become important in all sectors, there is a growing need to converge with economic development policies (see discussions of European efforts at cross-sectoral greening) (Lenschow 2002). However, there is still no robust integrated policy assessment tool (notwithstanding good advances made in Europe) that ensures mainstreaming of environmental issues into all other sectoral policies (Wachter 2005, Steid and Meijers 2004).

In part, environmental problems and mismanagement of natural resources result from not paying the full price for the use of ecosystem services (Pearce 2004). Governments adopt many different objectives that are often competing or even in conflict with each other, failing to recognize that they all depend on properly functioning ecosystem services. When economic development is given higher priority than environmental protection, policy failure is aggravated by the fact that environmental organizations are often weak, are seen as just another special interest and usually lose out in policy battles. Another complicating factor is the fact that throughout the developing world there is a widespread lack of implementation and enforcement of environmental legislation, due to insufficient administrative capacities (Dutzik 2002).

Ideally, sound science should underpin environmental policy choices. There is little doubt that the knowledge base on the key environmental issues has expanded enormously since 1987, but still too little is known about how close potential turning points are, or how to achieve long-term sustainable development. As noted in *Our Common Future*, "science gives us at least the potential to look deeper into and better understand natural systems" (WCED 1987). The Brundtland Commission observed that scientists were the first to point out the growing risks from the ever-intensifying human activities, and they have continued to play that role in an increasingly coordinated manner.

The Intergovernmental Panel on Climate Change, the Millennium Ecosystem Assessment, Global Environment Outlook, Global Marine Assessment, Global Forest Resources Assessment, Global Biodiversity Assessment, International Assessment of Agricultural Science and Technology for Development (IAASTD), and the Land Degradation Assessment in Drylands (LADA) are indicative of the shared concerns of the global science community, and a willingness to cooperate. These and other assessments have underpinned the MEAs, supported the global summits and conveyed important scientific information to the global community through the media and other means of dissemination. Scientists, statisticians, and people in other disciplines have become increasingly aware of the importance of communicating difficult issues in a form that decision-makers and the public can understand.

However, the almost daily diet of bad news emanating from these studies may have, paradoxically, conditioned the public and decision-makers to always expect predictions of disaster from scientists, despite the evidence that overall human well-being has progressively improved. The unceasing flow of scientific information has

itself provided political cover for indecision and delay (Downs 1972, Committee on Risk Assessment of Hazardous Air Pollutants and others 2004). When an isolated piece of good news on the science front, such as bringing back a species from the brink of extinction, is published, it is seized upon as evidence that the scientists are always exaggerating the dangers. The media, in their attempt at balanced reporting, can always find at least one scientist to contradict the general consensus of the majority of scientists, resulting in the common political view that the science is still uncertain, and, therefore, there is no need for precipitous action (Boykoff and Boykoff 2004).

The danger of this balanced, "no action needed yet" approach is that millions of lives might be needlessly lost, human health impaired, or species made extinct. The danger of delayed decisions has been clearly documented in the case of radiation, asbestos, chlorofluorocarbons, and other environmental and human health issues. Despite early warnings from scientists on these issues, it was decades before action was ultimately taken (EEA 2001). Similar delays are being experienced in relation to climate change and biodiversity loss.

The high degree of difficulty in finding innovative policy solutions for these persistent problems can be explained by several factors. The use of natural resources and the release of emissions to the environment are often determined by the logic of industrial production systems and their associated technologies. Hence, sustainable solutions require fundamental changes in industry structure, technologies and input factors for the sectors involved, such as mining, energy, transport, construction and agriculture. The government departments responsible for these sectors see their main duty as providing and securing the environment as a cheap (often free) input for production for their private (or public) sector clients. Such structural problems cannot be solved by environmental policy alone, but, instead, they need coordinated action by different parts of the policy making and implementation process of governments (Jänicke 2006).

International solutions are even more difficult to achieve, however, due to the relatively weak organizational framework and the many veto points that allow interest groups to stop ambitious policies (Caldwell 1996). Even where MEAs have been ratified by national governments, effective implementation is hindered by financial and technical capacity constraints, onerous

Sign of the times; action lags far behind.

Credit: Frans Ijserinkhuijsen

reporting procedures, non-cooperation of non-state actors and attention to other pressing issues (Andresen 2001, Dietz and others 2003).

Effective policy instruments are those that provide long-term signals and incentives on a predictable basis. This is vitally important to the business sector, but also to consumers and households. Publishing long-term plans for how regulations will be tightened is one way of easing changes. To be socially acceptable, redistributive instruments, such as regulatory constraints and environmentally related taxes, and other economic instruments also need to be seen as fair and equitable.

Promising transformative policy options

There are a few promising policy options that demonstrate the power of innovative policies to contribute to the structural changes needed to solve persistent environmental problems. These need to be carefully monitored, and lessons learned disseminated widely and quickly, so that successful policies can be added to the toolbox, always bearing in mind the need for local adaptation and social learning.

Green taxes

A small part of increased tax revenue can be designated for increased energy conservation and energy efficiency measures. Taxing environmental "bads" and subsidizing environmental "goods," while simultaneously achieving income redistribution is typical of the kinds of policies needed to bring the environment to the forefront of political decisions (Andersen and others 2000).

Reduce, Reuse, Recycle (3R) Policy in Japan

The Basic Law for Establishing the Recycling-based Society, enacted in 2000, seeks to lower waste volume (see Table 10.2) To make the law operational, the Fundamental Plan for Establishing a Sound Material-Cycle Society was formulated in 2003 for implementation over 10 years (MOEJ 2005). In addition to calling for greater recycling, disposal and collecting facilities, the law assigns an extended producer responsibility (EPR) to businesses that produce and sell products. EPR functions through a take-back requirement, deposit refund schemes and the shifting of financial and/or physical responsibility of a product at the post-consumer stage upstream to the producer. A policy on EPR has been introduced for containers, packaging and some household appliances.

The achievements of the policy so far have been encouraging, with an increase in the number of units recovered (post-consumer use) at designated collection sites in 2003 and 2004, of 3 and 10 per cent respectively, compared with 2002 (MOEJ 2005).

The circular economy in China

The circular economy covers production and consumption involving diversified sectors of industry, agriculture and services, as well as the industry of comprehensive recovery and utilization of resources from wastes and scrap (Yuan and others 2006). Production is addressed at three levels in terms of establishment of small-scale cycling, focusing on clean production in enterprises, intermediate-scale cycling in eco-industrial parks, and large-scale cycling in eco-industrial networks in various localities. The circular economy is aimed at the renovation of conventional industrial systems, targeting improvements in resource and energy efficiency and decreasing environmental loads. Steps have also been taken to establish sustainable consumption mechanisms, including the advancement of green procurement by the government.

The government has set the following national targets for 2010 using 2003 indicators as the baseline (China State Council 2005 in UNEP 2006a):

- resource productivity per tonne of energy, iron and other resources increased by 25 per cent;
- energy consumption per unit of GDP decreased by 18 per cent;

Table 10.2 Quantitative targets for Japan's 3R Policy for 2000–2010

Item	2000 Indicator	2010 Target
Resource productivity	280 000 yen (US$2 500) per tonne	390 000 yen (US$3 500) per tonne (40% improvement)
Target for cyclical use rate	10%	14% (40% improvement)
Target for final disposal amount	56 million tonnes	28 million tonnes (50% reduction)

- average water use efficiency for agricultural irrigation improved by up to 50 per cent;
- reuse rate of industrial solid waste raised above 60 per cent;
- recycle and reuse rate for major renewable resources increased by 65 per cent; and
- final industrial solid waste disposal limited to about 4.5 billion tonnes.

Implementation of the circular economy policy has been fairly recent, involving 13 provinces and 57 cities and counties nationwide. A relatively small number (5 000) of enterprises have passed the assessment for clean production and 32 enterprises have won the title of National Environmentally-friendly Enterprises. China's efforts to decouple economic growth and resource consumption warrant close monitoring over the next few years.

Lead markets for environmental innovations

Environmental innovations are typically developed in "lead markets" (Jacob and others 2005, Jänicke and Jacob 2004, Beise 2001, Meyer-Krahmer 1999).

The emergence of lead markets, such as for the use of wind energy, requires political will, a long-term and integrated strategy and favourable conditions such as for innovation.

Credit: Jim Wark/Still Pictures

These are countries that lead in adopting innovation, and where the penetration of markets is more encompassing than in others. They serve as a model for, and their technologies and related policies are often adopted by other countries. The concept of lead markets has been developed and fruitfully applied for many types of technological innovations, such as the mobile phones that were introduced in Finland, the fax in Japan or the Internet in the United States (Beise 2001). Lead markets for environmental technologies are typically not only stimulated by more pronounced environmental preferences of consumers in that country, but also depend on special promotion measures, or on direct political intervention in the market.

Examples of environmental protection lead markets include the legally enforced introduction of catalytic converters for automobiles in the United States, desulphurization technologies in Japan, Danish support for wind energy, the waste from electrical and electronic equipment directive of the European Union and CFC-free refrigerators in Germany (Jacob and others 2005). Another example is the global distribution of chlorine-free paper. This initially involved political activities by Greenpeace, and support from the USEPA in the United States. There was the introduction of chlorine-free paper whitener in Scandinavian countries, Germany and Austria, and effective political market intervention in Southeast Asian countries (Mol and Sonnenfeld 2000). This shows that political action that stimulates internationally successful innovations is not limited to governments, but that environmental activists can also intervene effectively.

The emergence of lead markets is not a matter of introducing a single policy instrument. Instead, political will, a long-term and integrated strategy, and favourable framework conditions (for example, for innovation) are decisive (Porter and Van der Linde 1995, Jacob and others 2005). Most important is the strong correlation between economic competitiveness and environmental policy performance (Esty and Porter 2000). The development of lead markets requires an innovation-oriented and ambitious environmental policy, integrated in a comprehensive innovation and industrial policy (Meyer-Krahmer 1999). Countries that attain the image of pioneers in environmental policy making are more successful in setting global standards (Porter and van der Linde 1995, Jacob and others 2005).

Innovative solar power has promoted the use of renewable energy.

Credit: Frans Ijserinkhuijsen

Lead markets fulfil a range of functions. From an international perspective, they provide marketable solutions for global environmental problems. Lead markets in high-income countries are able to raise the necessary funds for the development of technologies, which may assist them through teething troubles. By demonstrating both technical and political feasibility, they stimulate other countries and enterprises to adopt their pioneering standards. From a national perspective, ambitious standards or support mechanisms may create a first-mover advantage for domestic industries. Furthermore, ambitious policy measures can attract internationally mobile capital for the development and marketing of environmental innovations. Finally, these economic advantages legitimate the national policy-makers, and an ambitious policy provides them with an attractive, influential role in the global arena.

Transition management in the Netherlands

Against a common failure of environmental policy to effectively transform large technological systems, the concept of transition management has been developed in the Netherlands (Rotmans and others 2001, Kemp and Rotmans 2001, Loorbach 2002, Kemp and Loorbach 2003). The concept focuses on "system innovations," which are defined as fundamental changes of technical, social, regulatory and cultural regimes, which, in their interactions, fulfil specific societal needs, such as transport, food, housing, water and energy. A system change requires co-evolution of technologies, infrastructure, regulations, symbols, knowledge and industrial structure. Historical examples of system innovations are the transition from wind-powered to steam-powered ships, or from wood-based energy to coal-based energy. Such system changes typically require a time frame of 30–40 years (Kemp and Loorbach 2003).

Such a long time frame and the necessary encompassing changes are not manageable by conventional governmental steering. Traditional policy making is segmented in specialized departments, and as is the case for most business actors, is rather short-sighted. Transition management is proposed to provide advanced performance in steering system innovations. However, transition management includes no claim to actually plan transitions, but instead aims to influence the direction and speed of transition processes. The process can be divided into four distinct phases:

- creation of an innovation network (transition arena) for a defined transition problem that includes representatives from government, science, business and NGOs;

- development of integrated visions and images about possible transition paths that span 25–50 years, and, based on these visions, derivation of intermediate objectives;
- the execution of experiments and concerted actions according to the transition agenda (experiments may refer to technologies, regulations or modes of financing); and
- monitoring and evaluation of the process, and implementation of the results of the learning processes.

Successful experiments need to be taken up by the policy process and their diffusion promoted.

Several projects have been underway in the Netherlands since 2001 to experiment with this strategy. Though transition management is not expected to yield immediate results, initiatives in the energy sector indicate that the processes have led to:

- more integration of existing policy options and approaches;
- development of coalitions and networks among stakeholders (from 10 in 2000 to several hundred by the end of 2004);
- more investments (from about US$200 000 in 2000 to US$80 million in 2005) including "relabelled" and additional funds; and
- more attention to the issues with a long-term perspective (Kemp and Loorbach 2003).

Box 10.3 Environment in Tanzania's public expenditure review

Tanzania's National Strategy for Growth and Reduction of Poverty 2005–9 (MKUKUTA) cast aside assumptions employed in earlier strategies about the "priority" status of certain sectors and consequently their protected budgets. It promotes an outcome-based approach, opening the doors to cross-cutting concerns, such as the environment, which had previously been marginal. The key to the door was the Ministry of Finance's public expenditure review (PER) system, which revealed how alternative investments contribute to the planned outcomes:

- environmental investments can support health, agriculture, tourism and industry, and contribute to government revenues;
- there has been significant underpricing and very low revenue collection, especially in fisheries and wildlife;
- some environmentally sensitive "priority" sectors spent nothing on environmental management;
- districts responsible for environmental assets received little of the revenue; and
- fixed government budget formats constrain environmental integration.

The PER case was compelling: the 2006 official environment budget was considerably improved, and the general budget format now requires environmental integration.

Source: Dalal-Clayton and Bass 2006

Improving consideration of the environment in development decision making

Governments pursue a range of different, sometimes even competing or conflicting objectives. While the division of labour among government departments can be effective and efficient, it is less effective for cross-cutting issues, such as protection of the environment. Even worse, environment is often treated as just one more sector to be balanced against other social objectives, rather than providing the foundation on which all life depends. There has been limited progress in moving environmental considerations from the margins of economic and social decision making, but much more needs to be done.

Environmental policy integration

The need to incorporate environmental concerns into the decision making procedures of non-environmental policies has been a constant challenge for better government. Previously, environmental policy integration (EPI) was the responsibility of environmental agencies alone. However, it proved to be difficult to effectively interfere in the policy domains of other departments. Therefore, a number of countries shifted the responsibility for integrating environmental concerns towards the sectors themselves. This means that government departments that previously were opposed to a comprehensive greening of their policies, such as those responsible for transport, industry, energy and agriculture, must become responsible and accountable for their environmental performance (see Box 10.3).

Such an approach can be seen as "governmental self-regulation." It is up to each department to choose the best means for incorporating environmental objectives in its portfolio of objectives, in a consistent national strategy, and to report on the outcomes. For example, many ministries of industry have established eco-industrial parks or industry clusters with advanced waste treatment systems (UNIDO 2000). To make such a shift in responsibilities work, however, there is a need for high-level commitment by cabinet or parliament, or a clear lead by a designated ministry, and also a need for clear and realistic objectives, indicators and benchmarks, as well as for provisions for

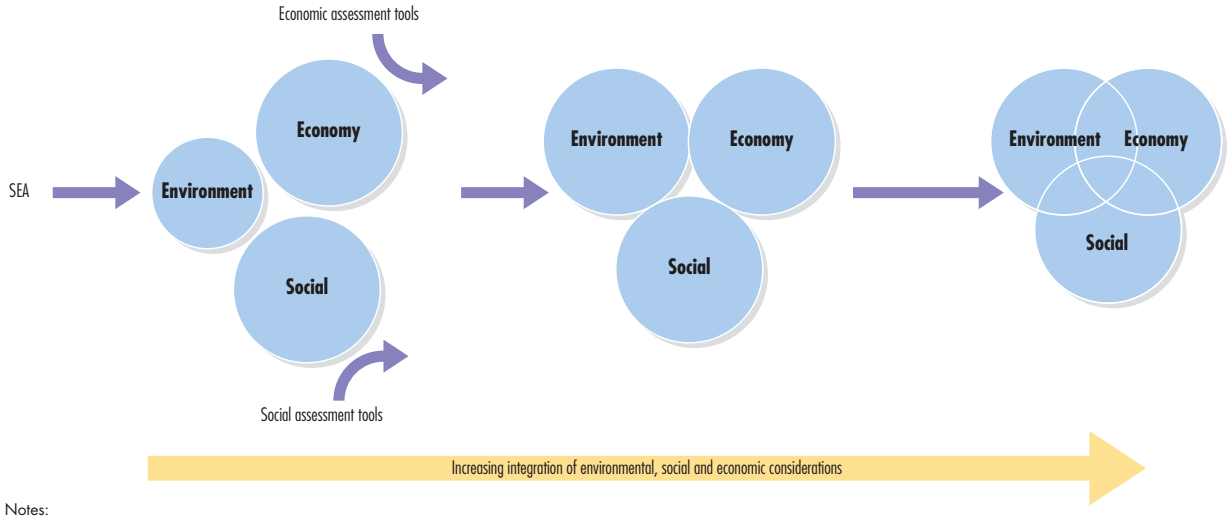
monitoring contents. The Cardiff Process in the European Union can be seen as one model for this type of EPI (Jacob and Volkery 2004).

Policy appraisal and impact assessment

Tools for incorporating environmental concerns into other sectoral policies include strategic environmental assessments (SEA) (Figure 10.4), regulatory impact assessments (EEA 2004, CEC 2004) and other forms of policy appraisal (see Chapter 8). These instruments aim at identifying possible unwanted side effects and conflicts of interests during the formulation of policies. Typically, plans, programmes and policies are assessed against a number of criteria by the government agency itself. While offering great potential for learning and increased transparency (Stinchcombe and Gibson 2001), the findings are rarely used. The United States and Canada were pioneers in introducing environmental assessments for planned policies in the 1970s. SEA was rediscovered by the European Union in the 1990s. However, SEA application is generally limited to plans, policies and programmes that have a direct impact on the environment (World Bank 2005). Generic policies are usually exempted from the need to conduct an assessment of their environmental impacts, although these could be considerable.

Examples include SEAs of multilateral bank plans and programmes, the United Kingdom's integrated policy appraisal and regulatory impact assessments, the European Union's integrated assessment, and Switzerland's sustainability assessment (Wachter 2005, Steid and Meijers 2004). Recently, there has been a trend towards integrating the requirements to assess impacts, such those as on gender, business, SMEs, environment and the budget, in a single, comprehensive procedure or integrated assessment (IA). Initially, the focus of IA was restricted to minimizing costs for business actors and increasing the efficiency of regulation. This form of regulatory IA did not pay much attention to unintended side effects or non-market effects (Cabinet Office 2005). IA aims at analysing a wide array of generic aspects, such as enhancement of competitiveness, support for small and medium enterprises, consideration of gender aspects or consideration of environmental concerns. Such an integrated perspective aims to reveal conflicts between objectives, or to identify win-win solutions. Denmark, Canada, the Netherlands, Finland, Sweden and the United Kingdom have been main forerunners, although it is significant that Poland is now requiring sustainability impact assessments. This trend reflects a growing insight that side effects, interlinkage effects or non-market effects may have severe implications in other policy areas, and, therefore, need to be taken into account.

Figure 10.4 A continuum of SEA application



Notes:

1.The increasing circle size implies the "weight" given to the environment. The overlapping indicates the extent of integration.

2.The right hand end of the continuum implies sustainability where all three pillars of sustainability are given equal "weight" and are fully integrated.

3.The aim of environmental mainstreaming has first been to get environmental considerations addressed in policy making, planning and decision taking, and then to promote increasing integration in addressing environmental, social and economic considerations.

4. Progress is being made in the application of key environmental, social and economic strategic assessment tools towards increasing integration.

Source: OECD 2006

Although IA is a rather generic tool, it has the potential to improve EPI, because it requires ministries or agencies to consider environmental concerns early in the process of policy formulation. Furthermore, these other sectors are required to consult environmental ministries, agencies and relevant stakeholders early in the process. Some initial evaluations of IA schemes, however, demonstrate the possibilities to misuse such approaches to roll back environmental concerns under the rubric of a better regulatory agenda (Wilkinson and others 2004, Environmental Assessment Institute 2006, Jacob and others 2007).

Ultimately, the effectiveness of various forms of environmental assessments will be judged on how they influence policy processes to better manage the environment and enhance human well-being.

Decentralization and delegation

Another innovative approach to integrating environmental concerns in policy making is the inclusion of environmental objectives in controlling systems. New public management gives more discretion to the different units and levels of policy making. In many countries, control by central departments is exerted by adapting controlling mechanisms to delegated governmental units.

There are some generic lessons to be drawn from existing examples of decentralization, and the integration of environmental concerns.

- To close the gap between rhetoric and hard action in sectoral strategies, regular evaluation is necessary. This can be performed by regular reporting to parliament or the cabinet on progress achieved in implementing the plans. In some countries, the national audit office is mandated to audit and report on the environmental and sustainable development performance and financial management of their respective governments. Canada appointed an independent Commissioner of the Environment and Sustainable Development in the Office of the Auditor-General, while New Zealand established an independent Parliamentary Commissioner for the Environment. The evaluation by review through international organizations has proven to be influential in the case of OECD (OECD 2000). The OECD environmental performance reviews also help member states monitor the implementation of their own policies and achievements in meeting their own targets. Recently, the European Commission initiated a review of the National Strategies for Sustainable Development of its Member States (European Commission 2006).
- The decentralization of responsibility for the environment increases transparency regarding environmental performance and policies of the different governmental sectors.
- The initial momentum for decentralization often comes from a central institution in government, such as the prime minister, the cabinet or the parliament. However, EPI is unlikely to remain prominently on the political agenda of these institutions for long. Therefore, it is necessary for this initial momentum to be used to quickly integrate EPI into regular procedures and institutions of policy making.
- For sustained integration of environmental concerns, it is necessary to couple EPI with the financing mechanisms of government. A number of countries experimented selectively with defining environmental criteria for their spending programmes for infrastructure, and regional and structural development. But, few countries have conducted an in-depth expenditure performance review to reveal spending that is contradictory to environmental objectives (see Box 10.3).

Beyond environmental agencies

Requirements to routinely report on environmental impacts, and appraisal of sectoral policies tend to keep the environment high on the agendas of non-environmental sectors of government. However, for effectiveness these reporting requirements have to be supervised by independent organizations with a strong mandate. In some countries, environment ministries oversee these activities. However, as junior ministries often they cannot prevail over more powerful agencies. In other countries, the responsibility has been shifted to the office of the prime minister. In a few countries (United Kingdom and Germany), national parliaments have set up committees to oversee these activities. Canada and New Zealand mandated the auditors-general to service the parliamentary committees. In some countries, although still underutilized, scientific advisors are assessing environmental policies (and their integration) on a regular basis (Eden 1996) and international policy assessment, comparisons and recommendations have been published in different fields by several research organizations. Environmental ministries do not become obsolete in these

approaches, as they have to organize the knowledge base for policy making, provide indicators and data for monitoring and assessment, organize the political process to adopt goals and objectives. Ministries in interested countries could even join forces with the scientific community to utilize experience across the borders, and benchmark environmental performance of different sectors.

It is apparent that environment is moving closer to the core of societal concerns under increasing social pressure upon governments everywhere, and this has already produced a change in the meaning of moving environmental concerns "from the periphery to the core" in decision making. This includes a better understanding of the nature of the existing core of decision making and its drivers, and of the place and role of the environmental issues in it. For too long, the existing core of decision making has been organized around the preservation of a given set of conditions indispensable for the ceaseless accumulation of material wealth. Under that orientation, the environment is necessarily expressed as just another variable of economic policy, implying that nothing more than trade-off decisions are needed. Moving the environment from the periphery to the core of decision making means transforming the core so that eventually the economy and society are reoriented to achieve sustainable environmental quality and human well-being. This reorientation implies major educational, institutional and financial changes.

CONDITIONS FOR SUCCESSFUL IMPLEMENTATION OF A NEW POLICY FRAMEWORK

The drivers-pressures-state-impacts-response (DPSIR) framework is used as a basis for understanding interactions between people and the environment. While the proven problems have often been successfully addressed by targeting a single sector or a single link in the DPSIR chain, persistent problems are more likely to require multisectoral or cross-DPSIR approaches, particularly targeting drivers. The following sections review the types of structural innovations that could form the basis of a more ambitious global policy agenda.

Public awareness, education and learning

Collective learning (Keen and others 2005) and adaptive management (Holling 1978) are management approaches aimed at coming to grips with complexity and uncertainty. Implementers and other stakeholders at different levels are encouraged to collect data and information, and process it in a manner and format that provides feedback and self-learning. Capacity building support is being provided to improve indigenous and/or community-based systems of monitoring, and to relate it to higher levels of information aggregation and decision making. For instance, indigenous knowledge of ecological systems may be included in designing policies, and evaluating the impact of these policies through the use of innovative indicators.

Cotton farmers training centre in Tanzania: feedback from local knowledge will help improve innovation.

Credit: Joerg Boethling/ Still Pictures

Box 10.4 Rio Principle 10 and the Aarhus Convention

Principle 10 of the 1992 Rio Declaration articulates a right to environmental information, decision making and justice. It is often called the "access principle."

While Principle 10 is a very "soft" measure, it has had considerable impact, and has been converted to a "hard" policy in a regional context through the Aarhus Convention, negotiated under the auspices of the UN Economic Commission for Europe (UNECE). Signed in the Danish city of Aarhus in 1998, it became effective in 2001, and by early 2005 had been ratified by 33 countries in Europe and Central Asia. Not only did non-government organizations (NGOs) have an unusually strong influence on the negotiation process, but they have also been given a central role in its operational procedures. Environmental NGOs are represented on the Bureau of the Meeting of the Parties, in follow-up task forces and in the compliance mechanism, which allows the public to submit allegations of non-compliance. Some examples of its provisions are:

- Information has to be made effectively accessible on activities or measures that influence air, water, soil, human health and safety, conditions of life, cultural sites and built structures. For example, each party shall establish a nationwide pollutant release and transfer register (PRTR) on a structured, computerized and publicly accessible database, compiled through standardized reporting.
- Public participation is required in decision making on whether to allow certain types of activities – for example in the energy, mining and waste sectors – and there is an obligation on the decision making body to take due account of such participation, which should also be part of more general decision making on environmental plans and programmes.
- Access to justice is provided for in relation to the review procedures for access to information and public participation, and to challenge breaches in environmental law.

The first report on the status of implementation of the convention indicates that most progress has been made on access to information, a bit less on access to participation and the least on access to justice. This result parallels another study on the implementation of the Rio Principle 10 in nine countries around the world. The convention has the potential to exert influence beyond the UNECE region. It is open to signature by countries outside the region, and the signatories have agreed to promote the application of its principles in international environmental decision making processes and in international organizations related to the environment.

Sources: Petkova and Veit 2000, Petkova and others 2002, UNECE 2005, Wates 2005

For example, the Poorest Areas Civil Society Programme, encompassing 100 of the poorest districts in India, has developed a unique information technology-based monitoring, evaluation and learning (MEAL) system (PACS 2006). With the active participation of more than 440 civil society organizations (CSOs) and 20 000 community-based groups, MEAL synthesizes information from numerous sources, including village profiles and baseline reports, quarterly reports, output tracking, appraisal reports, process reflection, case studies and research documents. The MEAL system has helped to improve programme efficiency, and ensure sharing of knowledge and experiences between participating CSOs and other interested agencies.

Collective learning approaches imply a strong commitment to share information for public awareness and education. It builds public opinion, based on sound and relevant information, leading to participatory decision making, and, ultimately, good governance. Public awareness initiatives may be targeted or broad based. As an example of the latter, the Aarhus Convention establishes rights of the public (individuals and their associations) for access to environmental information, public participation in environmental decision making, and justice (see Box 10.4). Parties to the convention are required to make necessary provisions for public authorities (at the national, regional or local level) to ensure that these rights are effective. South Africa's open information policy is an example of national application of these principles.

Globally, the UN Decade of Education for Sustainable Development is an important initiative to reach out to a broad audience, especially to the younger generation, both in and outside of the school curriculum (UNESCO 2005b). Targeted health and sanitation awareness, coupled with capacity building, empowered poor communities in Kimberly, South Africa, to build sustainable household sanitation (SEI 2004). Similarly the success of the sustainable cities initiative in Curitiba, Brazil was heavily dependent on the awareness building, and involvement of local communities (McKibben 2005).

The environmental performance reviews carried out by international organizations, such as the OECD and the UNECE, and now being prepared by UNECLAC and other UN bodies and organizations at regional level, are important and effective mechanism for strengthening collective learning. Such peer reviews contribute to independent, outside evaluation of the effectiveness, efficiency and equity of environmental policies, with sound, fact-based analysis, and constructive advice and recommendations. They give substance to the goals of accountability, transparency and good governance, and provide a way of exchanging experience and information about best practices and successful policies among countries in a regular and systematic manner (OECD 2000). Peer reviews are very effective in stimulating internal learning, but less effective in conveying learning external to the review area. One way of increasing the learning value is to encourage peer review institutions to do more cross-country comparisons or "benchmarking." This will also

Regular assessment and evaluation of the effectiveness of policies is important.

Credit: Ngoma Photos

lead to more convergence when it comes to choice of methodology and terms.

The collective learning approach aligns with the complex interactions characterizing the ecosystem approach to environmental management. It recognizes the need to collect and synthesize information on ecosystem structure and function, recognize that different levels in the ecosystem are interrelated and interdependent, and adopt management strategies that are ecological, anticipatory and ethical. The concept of humanity as part of the ecosystem, not separate from it, is a vital underlying principle of the ecosystem approach. The health, activities and concerns of local stakeholders should be viewed as characteristics of the ecosystem in which they live. It also means that stakeholders need to be included in decisions that affect their environment (NRBS 1996).

Monitoring and evaluation

Even where transformative policies are in place and organizations have been reformed to implement those policies, it is still necessary to know if the set goals and targets are being met. Not only monitoring is needed, but regular assessment and evaluation in terms of the effectiveness of policies is important. Statistical departments need to have their mandates expanded to collect data on policy implementation. Few countries mandate their national accounting offices with independent policy evaluation. International and regional organizations have developed programmes for policy monitoring and evaluation, such as the OECD environmental policy performance reviews (Lehtonen 2005).

Most countries have set up advisory boards, with experts and stakeholders to provide policy advice on issues of sustainable development. However, their mandate and their resources are often limited. Only a few countries, for example, Austria, France and Switzerland, have commissioned independent evaluations of their overall policy performance (Carius and others 2005, Steurer and Martinuzzi 2005). While there are some promising steps towards a systematic and independent policy evaluation beyond self-reporting, these examples require expansion. Recent efforts by the European Union, OECD and by UN agencies to organize evaluation and peer reviews of national strategies for sustainable development can bring momentum in the further advancement of such processes (Dalal-Clayton and Bass 2006, European Commission 2006). Traditional approaches to monitoring and evaluation, especially in command-and-control regimes, have tended to focus on tracking changes and taking retroactive corrective action. As a consequence, there has been a resistance from implementers to report to regulators (Dutzik 2002), and a tendency to provide only minimal information, often with emphasis on positive aspects. Even with external evaluators, who most often spend very short periods on site, it is difficult to capture the substantive issues. For persistent environmental problems, indicators need to be carefully chosen to represent timely change in underlying drivers.

Organizational reform

Robust organizations are critical for effective implementation of public policy. In the past two decades, there has been a diversity of organizational arrangements. Taking stock is a key component of evaluation to strengthen effectiveness. Because environmental problems cut across multiple jurisdictions and scales, it is necessary to target improvements at multiple levels.

Global level

The number of organizations, multilateral agreements, agencies, funds and programmes involved in environmental activities has increased significantly since 1972, when UNEP was established by the UN General Assembly (UNGA 1972). The increase has been more evident as a consequence of the follow-up to *Our Common Future* and other international processes. The 1990s was a decade of international conferences, including the Earth Summit in 1992 and global meetings on such issues as gender, population and food. Efforts to enhance system-wide coherence have been a recurrent feature of the governing processes of the evolving United Nations. Chapter 8 contains a diagnosis of global organizational challenges, as well a review of options to improve effectiveness. Reform at the global level is an area of dynamic debate, and crucial to the broader effort to find effective solutions to global environmental problems.

Regional level

At the regional and sub-regional levels, in spite of visible and pressing transboundary environmental issues, there are very few organizational mechanisms that have the capacity to address these complex issues. The European Union is possibly the most advanced, with ambitious agreements and strong enforcement powers of the European Commission. Today, about 80 per cent of the environmental regulations in the member states are rooted in European legislation. The Commission has the right to take action against member states for infringement of European law. There are effective organizational and constitutional means to avoid "a race to the bottom" on environmental standards (CEC 2004).

One example of dealing with a regional issue is acid rain (see Box 10.5). The Convention on Long-range Transboundary Air Pollution, signed in 1979 under the auspices of UNECE, spans from the Russian Federation in the east, to Canada and the United States in the west. A soil protection policy is also being formulated.

The Central America Commission for Environment and Development (CCAD) is headed by ministers who are political leaders in the region, with linkages to other ministers in charge of, for example, agriculture, coastal resource management, urbanization, gender, biodiversity conservation, environmental health, food security, economy, marketing, disaster mitigation, education, tourism, energy and mines, and poverty alleviation. They ensure policy synergies, and harmonize the legal frameworks in the region. There is good experience built up by environmental ministries working together with local government and civil society on interlinkages and cross-cutting issues in the Meso-American Region, which includes Mexico and Central America. Projects include the Meso-American Biological Corridor and the Meso-American Barrier Reef. In Africa, the African Ministerial Conference on the Environment (AMCEN), established in 1985, is a permanent forum where environment ministers meet on a regular basis to discuss environmental topics. ASEAN has no regional environment agency, preferring to work through standing committees. The Commission for Environmental Cooperation (CEC), was created under the North American Agreement on Environmental Cooperation as an environmental "side agreement" to the North American Free Trade Agreement between Mexico, United States and Canada. The CEC's role is to address regional environmental concerns, help prevent potential trade and environmental conflicts, and to promote the effective enforcement of environmental law.

Box 10.5 Acid rain

One of the early defining activities of European environmental regulation was action on the sulphur emissions that contribute to acid rain and damage human health. Removing the worst of acid rain has been a major success story for collaborative European environment policy (see Chapters 2 and 3).

Europe began a programme to address acid emissions after the Stockholm environment conference in 1972. The 1979 UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP) promoted region-wide monitoring and assessment, and created a forum for negotiating regulatory standards. Initial reductions were based on arbitrary reductions from a common baseline. By the late 1980s, Europe had adopted an integrated approach, addressing the problems of acidification, eutrophication and tropospheric ozone. From 1994, regional reduction protocols all addressed these problems through a "critical loads" approach, regulating emissions of sulphur dioxide, nitrogen oxides, ammonia and non-methane volatile organic compounds to improve the protection of the most vulnerable ecosystems. Such an approach was made possible by agreement on a common monitoring system, a political commitment to target critical loads, and decision support tools that enabled negotiators to evaluate alternative regulatory schemes in an integrated manner.

Today, the emission targets set by the European Union are somewhat stricter than those of the CLRTAP. Acid deposition is expected to continue declining, due to the implementation of the NEC Directive and corresponding protocols under the CLRTAP. Based on current projections, EU sulphur dioxide emissions will drop by 51 per cent between 2000 and 2010, when they will be lower than at any time since about 1900.

Sources: EEA 2005, Levy 1995, UNECE 2007

However, such regional organizational arrangements are not available everywhere, or, in some cases where available, they are prevented from functioning effectively by vested interests. East Asia, for example, does not have an organizational mechanism to address transboundary environmental issues, such as acid rain or dust and sandstorms in spite of these problems assuming serious dimensions.

National level

National governments and agencies continue to be the nodal points in negotiating, implementing and enforcing environmental policies. Despite the emergence of non-state actors, and the transfer of some responsibilities to the global, regional, sub-national and local levels, governments still control major resources for implementing environmental policies. Most countries have a basic organizational framework for environmental policies, such as environmental ministries, basic laws and agencies to monitor and enforce environmental standards. However, effective implementation at the national level remains a challenge in many countries. Most countries have formulated environmental plans or strategies for sustainable development, with varying degrees of stakeholder participation and scientific rigour (Swanson and others 2004).

A relatively smaller number of countries have made conscious efforts to link their environmental policies with major public budgets. Norway and Canada review their budgets to ascertain the environmental impacts of proposed public spending (OECD 2001b, OECD 2004). The European Union requires an environmental impact assessment for spending on national projects from the structural and regional funds. Despite these examples, the organizational links between the major public budgets and environmental policies remain weak in most countries.

Some countries have established organizations at the national level to facilitate the use of market forces to address environmental problems. As seen in Chapter 2, carbon emissions trading has particularly benefited from these institutional arrangements. While the shift in taxation with a higher burden on energy-intensive industries has encountered stiff resistance from vested interests, ecological tax reforms have stimulated innovation and new employment opportunities.

At the national level, changes in attitudes of governments have been observed, with greater emphasis on stakeholder participation for solving environmental problems. This has been demonstrated by the participation of stakeholders,

Mechanisms to address transboundary environmental issues, such as acid rain or dust and sandstorms, are still not in place, despite these problems assuming serious dimensions.

Credit: sinopictures/viewchina/ Still Pictures

such as the representatives of civil society and the private sector, in joint fora with governments, UN agencies and other international organizations. Some countries have formalized the process of participation. For example, legislation has been passed in Viet Nam and Thailand to include indigenous people in forest management (Enters and others 2000). The Brazilian national system of conservation units recognizes community rights to use and management in a variety of zones, such as conservation areas, extractive reserves and protection forests (Oliveira Costa 2005). Decentralization and the emergence of innovative local governments offer opportunities for social learning and the possibility of scaling up successes (Steid and Meijers 2004, MOEJ 2005).

Box 10.6 The changing role of the state

For many countries, the middle of the 1980s saw the beginning of a transition in the role of the state, its core responsibilities and how it should manage them, with the emergence of various social actors. The changing role of the state led to further political decentralization, economic liberalization and privatization, as well as greater participation of civil society in decision making.

First, the transition translated into devolution of power from the central to the local and provincial governments. About 80 per cent of developing countries are experimenting with some form of decentralization. In virtually all countries, responsibility for local environmental issues, such as air and water pollution, waste management, and land management, belongs to local governments and municipalities. Decentralization reforms range from empowerment of elected local governments with natural resources mandates in Thailand, to the financing of village committees in Cambodia, and emerging co-management arrangements for water and forests in Viet Nam and Laos PDR. While cross-country experience suggests that the impact of decentralization on poverty and the delivery of public services is not straightforward, it is likely to have a positive impact on governance, participation and the efficiency of public service delivery.

Second, on the economic front the erosion of state power translated into large programmes of privatization of state-owned companies, worldwide. The private sector has since become one of the critical actors in facing global challenges such as climate change, and a primary stakeholder in the implementation of flexibility mechanisms allowed by the Kyoto Protocol to the UNFCCC, notably of projects under the Clean Development Mechanism and emissions trading.

Finally, the transition opened the door to civil society and its organizations, especially NGOs, to participate as active stakeholders in political, social, economic and environmental governance. For example, in Porto Alegre, Brazil, budgeting processes now involve consultations with civil society groups. In the United Kingdom, the Women's Budget Group has been invited to review government budget proposals. The Forest Stewardship Council brings together environmental groups, the timber industry, forest workers, indigenous people and community groups in certifying sustainably-harvested timber for export. More than US$7 billion in aid to developing countries now flows through international NGOs, reflecting and supporting a dramatic expansion in the scope and nature of NGO activities. In 2000, there were 37 000 registered international NGOs, one-fifth more than in 1990. More than 2 150 NGOs have consultative status with the UN Economic and Social Council, and 1 550 are associated with the UN Department of Public Information.

Sources: Anheier and others 2001, Dupar and Badenoch 2002, Furtado 2001, Jütting and others 2004, Work undated, World Bank 1997

Emerging organizing principles

Experience over the last few decades from initiatives at the global, regional, national and local levels to address complex environmental and inter-sectoral issues demonstrates some generic principles for public policy formulation and implementation. These include:

- decentralizing power to lower levels of decision making, where it is more timely and meaningful – the subsidiarity principle;
- transferring authority to other stakeholders who have a relative advantage, stake and competence in assuming the responsibility;
- strengthening and reinforcing the normative capacity of agencies operating at a higher level;
- supporting and facilitating the active participation of women, local communities, marginalized and vulnerable groups;
- strengthening the scientific base of monitoring ecosystem health; and
- applying an integrated ecosystem monitoring approach.

Decentralizing power

The principle of subsidiarity states that the higher entity ought not do what the lesser entity can do adequately unless it can do it better. The principle can be used to regulate the exercise of existing competencies, and guide the allocation of competencies. In the context of European integration, both functions can be found. Networks of local authorities, such as the International Council for Local Environmental Initiatives (ICLEI), have also served to shape better practices, for instance in water use and guidelines for green procurement.

Transferring authority to stakeholders

In several countries, a negotiated approach has been tested to engage a wide range of stakeholders in not only planning and consultations, but also in decision making, for example over management of river basins, forests and other natural resources (see Box 10.6). As described in Chapter 4, the negotiated approach, being decentralized and flexible, is effective in making water available at the grassroots level to areas distant from the main water source or delivery system. The negotiated approach empowers local water users, through the creation of formal and informal water management institutions, and the formalization of

The role of women in environmental management and sustainable development is vitally important and increasingly recognized. Above, women planting trees in Kenya as part of the Green Belt Movement.

Credit: William Campbell/ Still Pictures

existing knowledge and vision. Simultaneously, it is based on an ecosystem approach and wise use of ecosystems. Scaling up of local initiatives and bringing them to the higher decision making levels is one of the other characteristics of the negotiated approach (Both ENDS and Gomukh 2005).

Strengthening higher-level agencies

Transboundary environmental problems, such as acid rain, haze pollution, desertification, climate change, ozone depletion and loss of migratory species, and the management of shared natural resources pose a unique set of challenges to environmental governance. They highlight the need for decision making processes that go beyond national borders, and illustrate the necessity for creating mechanisms to address these issues at regional and global levels. This process has created new functions for international organizations, as nation states increasingly delegate some of their functions upwards to regional or international organizations to deal with transboundary environmental problems.

Through community legislation, action programmes and 30 years of standard setting, the European Union has established a comprehensive system of environmental protection. This covers issues that range from noise to waste, from conservation of the natural habitat to car exhaust fumes, from chemicals to industrial accidents, and from bathing water to an EU-wide emergency information and help network to deal with environmental disasters, such as oil spills or forest fires. The European Environment Agency (EEA) was set up to help achieve improvement in Europe's environment through the provision of relevant and reliable information to policy-makers and the public. The legislative powers, however, remain with the European Union. Several regional organizations elsewhere have initiated similar although limited, efforts, such as the North American Commission for Environmental Cooperation, the Ministerial Conference on Environment and Development in Asia and the Pacific, and the African Ministerial Conference on the Environment.

Facilitating active participation

Leading up to the 1992 United Nations Conference on Environment and Development, women organized themselves worldwide to have their voices heard in environmental decisions. This resulted in the recognition of women as one of the nine major groups in Agenda 21 for their roles in environmental conservation and sustainable development. In many related processes that followed, such as the meetings of the Commission on Sustainable Development, women fully participate. In these efforts, women often cooperate with other civil society groups, such as indigenous peoples,

trade unions and youth, resulting in negotiations that better reflect the interests of local communities, and marginalized and vulnerable groups. As described in Chapter 7, these global processes reflect similar initiatives at regional and national levels.

Strengthening the scientific base of monitoring ecosystem health

Over the last two decades, the tools and techniques for measuring specific environmental parameters have improved considerably. However, the science of understanding ecosystems and profiling ecosystem health at various spatial scales and for different policy domains is still comparatively nascent. The ecological relationships among various environmental parameters are complex. Added to this complexity are the human, social and economic dimensions of ecosystems. It is important to establish meaningful targets and indicators for these dimensions, such as the 2010 biodiversity targets, the Human Development Index and new indicators of ecosystem well-being.

Resilience analysis encourages monitoring systems to detect the proximity of the system to a critical threshold, the amount a system can be disturbed before crossing a threshold, and the ease or difficulty of returning to a previous state once the threshold has been crossed (Walker and others 2004). Measuring these key parameters may be the most cost-effective way of monitoring ecosystem health.

Changes in ecosystem functions have consequences for different sectors of society and for distant generations in terms of human well-being (see Chapter 7). From a policy perspective, it is relevant to track the degree to which these ecosystems can maintain their full capacity to function. The ecosystem health approach serves as a model for diagnosing and monitoring the capacity for maintaining biological and social organization, and the ability to achieve reasonable and sustainable human goals (Nielsen 1999). Yet, ecosystem health is not well monitored in most parts of the world.

Integrated ecosystem monitoring

The climate negotiations over the last decade, as discussed in Chapter 2, have clearly shown the links between a sound scientific basis for policy formulation and the politics of decision making. The science of understanding and profiling ecosystem health and its relationship to persistent environmental problems is invariably going to take some time. In the meantime, a practical approach to integrated ecosystem monitoring that enables policy and decision making is imperative. An integrated monitoring framework will include at least the following steps: identifying ecosystem goals, developing specific management objectives, selecting appropriate and measurable ecosystem indicators, monitoring and assessing the state of the environment, using chosen indicators, and taking appropriate action.

The effectiveness of participatory monitoring and learning is increasingly being recognized. However, this implies that stakeholders at various levels need flexibility to monitor and learn in the method and style with which they are comfortable, and which is most meaningful to them (see Box 10.7). The challenge then becomes how to rationalize and aggregate various kinds of data and information in a way that it is relevant at decision making levels – nationally, regionally or globally. For instance, how will the indigenous practice of monitoring a sacred grove relate to MDG 7 or the Convention on Biological Diversity? At the same time, the

Box 10.7 Monitoring implementation of the UNCCD in Niger

Niger, like the other countries that have ratified the UN Convention to Combat Desertification (UNCCD), has committed itself to produce periodic national reports that would take stock of progress made in the framework of the UNCCD implementation. Land degradation processes and dynamics are the subject of regular monitoring in Niger. In the framework of the implementation of the National Plan of Action to combat desertification (PANLCD/GRN), one strategic orientation is to watch and monitor desertification. Among other actions, systematic monitoring of the dynamics of land degradation provides an early warning system to better develop programmes to mitigate the effects of drought and desertification.

The rate of natural resources degradation is assessed especially through field projects and programmes, such as the Desert Margins Programme, which is collecting data on:

- an inventory of endemic, extinct or threatened plant species;
- features of domestic plant and animal biodiversity;
- features of the productive capital (land, vegetation and water), the climate and the socio–economic component at several scales;
- improvement of the understanding of pastoral areas' degradation mechanisms;
- improvement of knowledge regarding wetlands degradation mechanisms; and
- the fight against erosion, and soil fertility management.

Also, in the framework of the Project to Support Training and Assistance in Environment Management (PAFAGE in French) financed by Italy, a National Environmental Information System (SIEN) was set up.

Source: CNEDD 2004

Innovative approaches for raising funds for the environmental agenda have been initiated. Above, the Ngorongoro Conservation Area in Tanzania involves the conservation and development of the area's natural resources; the promotion of tourism; and the safeguarding and promotion of the interests of the Maasai people.

Credit: Essling/images.de/ Still Pictures (left); McPHOTO/ Still Pictures (right)

need for capacity building at different levels and technology cooperation needs to be recognized and acted upon.

Defining the frequency of monitoring can also be complex. The life cycles and time spans of environmental and ecosystem changes are much longer than political mandates and generally accepted project or programme time frames. As a consequence, political and programme organizations avoid or delay decision making, since the results may not be visible during their tenure. At the same time, there is also an overload of environmental information contributing to the "noise" in environmental decision making. Ideally, minimal information at different levels has to be available at the right time in a simple format for decision making.

A monitoring protocol that provides flexibility at the lower levels and yet is able to capture information and knowledge for policy and decision making at global, regional and national levels still needs to be developed. At the global level, a comprehensive review of the environment is required about every 3–5 years. This is provided by a range of organizations and processes, including the GEO process. However, a practical approach to integrated ecosystem monitoring and early warning is yet to be incorporated in these initiatives.

Financing the environmental agenda

Financing programmes to address conventional environmental issues, for example pollution control and groundwater depletion, is possible by strict implementation of "polluter pays" or "user pays" policies. It is also possible through public financing, if the source of the problem is harder to identify or the nature of the environmental good suggests this as the most appropriate approach.

However, financing programmes to eliminate persistent environmental problems is much more complex, since the changes needed involve most of society. There is no single polluter or single pollutant, no single group of identifiable "victims" and often no simple cause-and-effect relationship or dose-response equation (as the problem stems from the "driver" level in the DPSIR framework). Entire sectors, international relationships and the global economy may be involved. While grant funding is limited, capital for investment and loans is currently easily available globally. The limitations are set by higher risks and lower returns on investments in the developing countries that need it most.

There is room for mobilizing financial resources to manage conventional and persistent environmental problems. Agenda 21 (see Chapter 33, Article 13) clearly articulates that financing actions aimed at sustainable development must come from each country's own public and private sectors (UNCED 1992). This has been reaffirmed in several other international instruments, including in the Monterrey Consensus, the final document of the International Conference on Financing for Development (UN 2002b). Several studies have shown that there may be win-win opportunities in phasing out subsidies. For example, an IEA study of eliminating energy subsidies in eight developing countries concluded

that their annual economic growth would increase by over 0.7 per cent, while CO_2 emissions would go down by nearly 16 per cent (IEA 1999).

Public sector budgets

Countries may have room for increasing the level of government spending on environment (Friends of the Earth 2002). A modest increase would generate significant additional resources provided adequate priority is accorded to environmental issues in national budgets. For example, in Asia and the Pacific, the Asian Development Bank (ADB) has suggested that developing countries allocate at least 1 per cent of GNP to meet their financial requirements for environmentally sound development. At 1 per cent, the region's domestic resource contribution would be about US$26 billion/year (UNESCAP 2001), compared to defence budgets that range up to 6 per cent of GNP (ADB 2001). The European Commission's thematic strategy on air pollution in the EU member states is expected to give a positive return ratio of at least 6:1 (European Commission 2005).

Promising innovative approaches in raising additional funds for a new environmental agenda have also been initiated. Green budgeting, the creation of conservation funds, the introduction

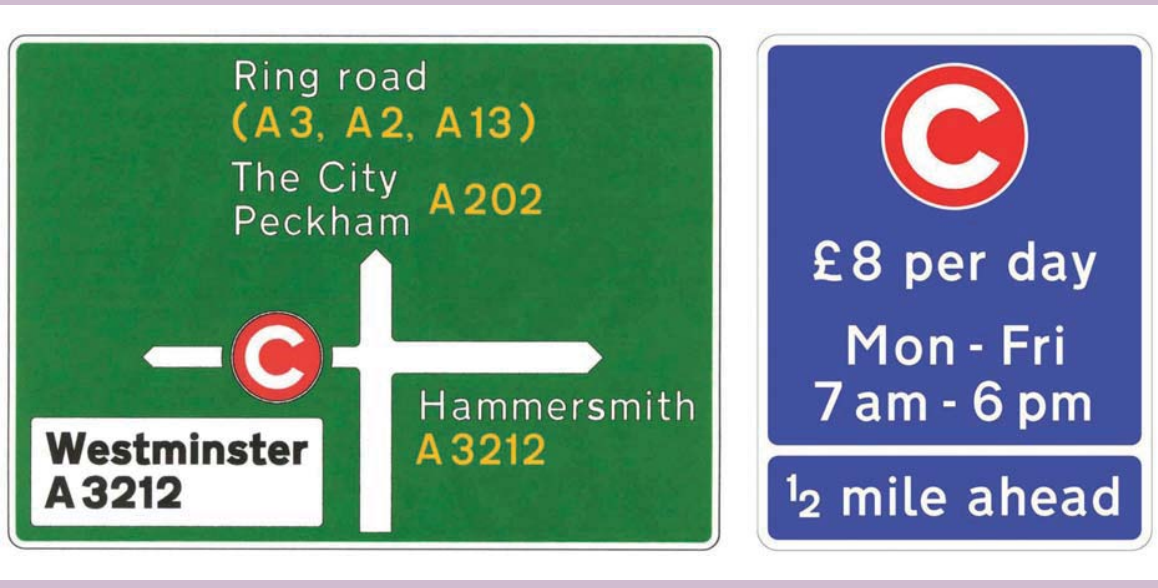
Box 10.8 Use of market-based instruments in Europe

The use of environmental taxes and charges has widened since 1996, with more taxes on CO_2, sulphur in fuels, waste disposal and raw materials, and some new product taxes. Only a few tax rates have originally been set on the basis of an assessment of environmental costs as was done for the landfill tax and levy on quarrying of sand, gravel and hard rock in the United Kingdom.

At the regional level, emissions trading has become the instrument highest on the political agenda, with the adoption of the EU Emission Trading Directive, for reducing CO_2 emissions, its incorporation into national laws and the establishment of national emissions allocation plans. The trading system started operating in 2005. There are a number of other trading schemes already in operation, including national emissions trading schemes for CO_2 in Denmark and the United Kingdom, and for NO_X in the Netherlands, certificate trading for green electricity in Belgium and transferable quotas for fisheries management in Estonia, Iceland, Italy and Portugal.

A range of other instruments are either planned or under serious consideration, notably pricing policies for water by 2010 under the EU Water Framework Directive, road charging systems, and the increased use of trading certificates for green electricity. These and other initiatives suggest that the use of market-based instruments is likely to increase in coming years, possibly as part of wider initiatives on environmental tax and subsidies reforms.

Source: Ministry of Environment, Norway 2005



The initially controversial congestion charge introduced in 2003 by the City of London, turned out to be very successful within a year (15 per cent less traffic in the charging zone and 30 per cent reduction in traffic delays).

Credit: Transport for London http://www.cclondon.com/signsandsymbol.shtml

of economic instruments such as user fees and charges, taxation and other forms of payments for the use of ecosystem goods-and-services (see Box 10.8), are among instruments that have been applied sporadically in various countries (ADB 2005, Cunningham and Grabosky 1998). A challenge has been to ensure that revenues collected are reinvested into the resource base, or support other ecosystems (cross-subsidization) rather than being diverted to other non-environmental purposes. Certain instruments, such as carbon taxes, that have a potentially significant impact on industry and national competitiveness, have been less prominent. To date, carbon taxes have only been introduced in about 12 countries worldwide, and their wider adoption has been a very slow process (OECD 2003).

The use of market-based instruments in environmental policy has gained ground substantially in Europe, including countries in Central and Eastern Europe, since the mid-1990s, especially in the areas of taxes, charges and tradeable permits. Comprehensive systems of pollution charges for air and water are being implemented, although the rates tend to be low, because of concerns about people's ability and willingness to pay. Several countries have also introduced resource use and waste taxes. Progress is being made on the wider use of taxes and charges on products, notably for beverage cans and other packaging.

Scandinavian countries and the Netherlands, which started early on environmental tax reform, remain at the forefront of developments. Germany and the United Kingdom have made much progress since the late 1990s. Measures are mainly taken at national or federal level, but increasingly instruments are being applied at lower levels, for example, resource taxes in Flanders and Catalonia and congestion charges in some cities, such as London, and, albeit more modest, Rome and Oslo.

Green taxes and charges

Approaches such as ecological tax reform and "tax shift" have been tried, whereby taxes on energy use and the consumption of other resources are increased while corresponding reductions are made on income tax. When introduced gradually and in ways that are revenue-neutral and easy to administer, such approaches can encourage environmentally-conscious consumption patterns without causing significant negative social distribution effects (Von Weizsäcker and Jesinghaus 1992). Some countries have attempted new ways of raising revenues, including through ecotourism. For example, the Protected Areas Conservation Trust in Belize, in Central America, receives most of its revenue from an airport tax of about US$3.75, paid by all visitors upon departure, together with a 20 per cent commission on cruise ship passenger fees. The British overseas island territory of Turks and Caicos designates 1 per cent of a 9 per cent hotel tax to support the maintenance and protection of the country's protected areas (Emerton and others 2006).

Payment for ecosystem services

Ecosystems such as forests, grasslands and mangroves provide valuable environmental services to society. They include provisioning services that furnish food, water, timber and fibre; regulating services that affect climate, floods, disease, wastes and water quality; cultural services that provide recreational, aesthetic and spiritual benefits; and supporting services, such as soil formation, photosynthesis and nutrient cycling (MA 2003). Biodiversity continues to underpin food security and medicinal goods. Unfortunately, current markets fail to reflect the value of such ecosystems and ecosystem services, creating a "mismatch between market and social prices" (UNEP and LSE 2005, Canadian Boreal Initiative 2005). As a result, ecosystem services are often viewed as free public goods by their beneficiaries. The combined effect results in overexploitation of ecosystems.

A new approach, called "payments for environmental (or ecosystem) services" (PES), attempts to address this problem. PES schemes pay those who engage in meaningful and measurable activities to secure the supply of ecosystem services, while the beneficiaries of the services pay to secure the provision of the services. Many PES schemes have originated in developed countries, particularly in the United States, where it is estimated that the government spends over US$1.7 billion yearly to induce farmers to protect land (USDA 2001). While the conservation goals may be laudable, the trade distorting nature of subsidies should also be considered. In the developing world,

Costa Rica, Brazil, Ecuador and Mexico have pioneered PES schemes to preserve freshwater ecosystems, forests and biodiversity (Kiersch and others 2005). The Wildlife Foundation is securing migration corridors on private land in Kenya through conservation leases at US$1/1 000m²/year (Ferraro and Kiss 2002).

Combined solutions

Three main markets for ecosystem services are emerging:

- watershed management, which may include control of flooding, erosion and sedimentation, protection of water quality, and maintenance of aquatic habitats and dry season flows;
- biodiversity protection, which includes eco-labelled products, ecotourism and payments for conservation of wildlife habitat; and
- carbon sequestration, where international buyers pay for planting new trees or protecting existing forests to absorb carbon, offsetting carbon emissions elsewhere.

Markets for carbon reduction credits are growing rapidly. From US$300 million in 2003 (IFC 2004), they are projected to rise to US$10–40 billion by 2010 (MA 2005). The World Bank alone had nine carbon funds amounting to US$1.7 billion by 2005. A concerted focus on four areas – carbon sequestration, landscape beauty, biodiversity and water – would help to address rural poverty (UNEP and LSE 2005).

Box 10.9 Documented returns on environmental investment

Many large economic sectors depend heavily on natural resources and ecosystem services, including agriculture, timber and fisheries. Therefore, investment in protecting environmental assets has the potential to generate tangible economic returns. Pearce (2005) reviewed 400 efforts to quantify such returns. Using conservative assumptions, the following benefit-cost ratios were documented:

- Controlling air pollution: 0.2:1 – 15:1
- Providing clean water and sanitation: 4:1 – 14:1
- Mitigating natural disaster impacts: up to 7:1
- Agroforestry: 1.7:1 – 6.1:1
- Conserving mangrove forests: 1.2:1 – 7.4:1
- Conserving coral reefs: up to 5:1
- Soil conservation: 1.5:1 – 3.3:1
- National parks: 0.6:1 – 8.9:1

Under alternative assumptions, taking into account longer-time frames and broader impacts on poor populations, even higher rates of return were found.

Source: Pearce 2005

While it is widely recognized that market failures need to be corrected, they are not necessarily solved through market solutions alone. A combination of market-based mechanisms and regulatory structures is often needed for markets to work successfully. The cap-and-trade model in the case of carbon emissions is an example of a regulatory framework defining overall emission limits before a market for emission credits could be established (UNEP and LSE 2005).

Financing the bottom of the pyramid

The new approaches to generating additional financial resources, especially through market-based and economic instruments, often have been possible because of an untapped willingness to pay for ecosystem services and environmental quality. For water, studies have shown that the poor often pay more per litre for unsafe, inconvenient and unreliable supplies than the rich pay for safe, publicly-funded piped supplies. Through multiple mechanisms, such as subsidizing bank lending rates, group lending schemes, and combining subsidies with user contributions, there are indications of willingness to pay, even at low level of income, for example in the renewable energy sector (Farhar 1999). Improved support systems for access to credit and markets are needed for the poor to participate.

Managing environmental resources and encouraging conservation efforts through mechanisms that generate employment and revenues in many diverse sectors, such as forest management, biodiversity conservation and investment in sustainable energy projects, have proved effective. Through the Rural Energy Enterprise Development (REED) initiative in Africa, Brazil and China, UNEP, in partnership with the United Nations Foundation and several NGOs, provides early-stage funding and enterprise development services to entrepreneurs who have helped build successful businesses in the supply of clean energy technologies and services to rural and peri-urban areas (UNEP 2006c). Such initiatives have demonstrated that even small-scale financial resources can trigger entrepreneurship and employment generation through environmentally-sound activities. Equally important is contribution to economic diversification and the creation of new markets, especially in slow-growth and poor countries and for local communities, for example women supported by conservation and income generation projects (Jane Goodall Institute 2006). Microfinance and credit for micro-, small- and

medium-sized enterprizes, particularly for those headed by women, have proven to be important means of enhancing access to credit and nurturing small-scale productive activities, especially in rural areas.

Global funding

Several financial mechanisms channelling grant funds have emerged at the international level, including the GEF. Typically, these address problems of global concern (global commons or public goods, such as clean air and biodiversity). There are many areas of environmental stress or degradation, however, where resources can only be mobilized at the domestic or local level. Often a financing scheme can be developed where local resource conservation can pay for itself in the long run, but local communities or domestic financial sources are not in a position to make the initial seed investment (see Box 10.9). In such cases, international loan or grant financing can be prudently utilized for domestic development purposes to "seed the dynamics." In addition to traditional sources of finance, there are many new or revamped mechanisms, such as debt-for-nature swaps, the Clean Development Mechanism, emissions trading, and attempts to create international funds for global public goods such as rainforests and biodiversity.

For many countries, attracting part of the foreign direct investment (FDI) to environmental management is a promising option. Though FDI is largely concentrated in a handful of fast-growing countries, especially in Asia, initiatives by the private sector, including through corporate social responsibility (CSR) and environmental responsibility, have been expanding in many parts of the world. CSR and corporate financing of certain social and environmental activities have been encouraged by global initiatives that have stimulated companies to report not only on their economic activities, but also on their social and environmental performance (GRI 2006 and Box 10.10).

There are some emerging but still controversial proposals, which include proposals for an aviation fuel tax (a long-standing historical omission), and a tax on international currency transactions. Air travel accounts for 3 per cent of global carbon emissions, and it is the fastest growing source of emissions (Global Policy Forum 2006). The IPCC expects air travel to account for 15 per cent of all carbon emissions in 2050 (IPCC 1996, IPCC 1999). In 2000, the European Parliament's Economic and Monetary Affairs Committee confirmed its support for a recommendation to allow the member states to impose a tax on domestic and intra-EU flights (Global Policy Forum 2000).

At the international level, the Initiative against Hunger and Poverty, bringing together Brazil, Chile, France, Germany and Spain has made various proposals on innovative mechanisms of public and private financing, including a proposal for a tax (solidarity levy) on air travel tickets to finance action against hunger and poverty. The initiative received support from 112 countries at the Summit of World

Box 10.10 Value at risk revisited

In April 2006, then UN Secretary General Kofi Annan launched the Principles for Responsible Investment (PRI) after ringing the opening bell at the New York Stock Exchange. Six months later, it had 94 institutional investors from 17 countries representing US$5 trillion in investments.

The launch of the principles created the first-ever global network of investors looking at addressing many of the same environmental, social and governance issues as the UN is tasked to address. One of the goals of the PRI community is to work with policy-makers to address issues of long-term importance to both investors and society. Investors representing more than 10 per cent of global capital market value have, therefore, sent the strongest of signals to the marketplace that environment, social and good governance issues count in investment policy making and decision making.

The PRI has evolved because investors have recognized that systemic issues of sustainability are material to long-term investment returns. Since large investors are becoming almost fully diversified, they recognize that the only way they can deliver for their beneficiaries, often pension holders, is to help address systemic issues in the market through shareholder engagement, transparency and better analysis of long-term sustainability risks and opportunities that can affect investments.

But, investors also need help from policy-makers. There are a range of areas where policy-makers could create the necessary environment that would encourage investors to take longer-term views on environmental, social and governance issues. Mandatory disclosure of environmental performance is one such area. Once investors are able to assess the risks involved in various activities, they are able to put pressure on companies to address those risks. But they are unable to do this if they are unaware of what the company is doing. Mandatory disclosure regimes level the playing field, and allow investors to take action when required.

Source: UNEP 2006d

Consumption patterns and global interdependence have contributed to growth in shipping and liberalization of trade.

Credit: Ngoma Photos

Leaders for Action against Hunger and Poverty, held in New York in 2004 (Inter Press Service 2005, UN 2005a) and by 2006, had gained enough momentum to be transformed into an international facility for purchasing medicines. Although many countries have expressed interest, there is a widely shared view that any proposed schemes involving taxes would best be applied nationally but coordinated internationally (UN 2005b).

A tax of about US$6/passenger, with a US$24 surcharge for business class, would generate about US$12 billion a year, about one-fourth of the annual funding shortfall for meeting the Millennium Development Goals (UN 2005c). In 2006, France initiated an additional tax, from US$2.74 for economy class to US$27.40 for business class on national and European flights. On intercontinental flights the tax rises to US$51. The tax is expected to raise about US$266 million a year. In addition to channelling funds for the International Drug Purchase Facility (IDPF-UNITAID), countries may also be interested in joining the initiative to raise funds for environmental purposes (UNITAID 2006).

Tapping international trade

The potential of international trade as a source of finance for sustainable development has been stressed in numerous international fora and instruments (UN 2005b, UN 2002b, WTO 2001). Liberalization of trade in goods-and-services of interest to developing countries can generate additional financial flows totalling about US$310 billion yearly (UNCTAD 2005). Realizing this potential will depend on success in achieving a rules-based, open, non-discriminatory and equitable multilateral trading system, as well as meaningful trade liberalization that benefits countries at all stages of development.

Estimating the needed resources

Estimates by the World Health Organization (WHO) of the costs and benefits of meeting the MDG targets for water and sanitation total about US$26 billion, with benefit-cost ratios that range from 4 to 14 (Hutton and Haller 2004). Different provisional estimates prepared for the World Bank, though putting the costs at twice the WHO estimates, still result in a benefit-cost ratio of 3.2 to 1, and could save the lives of up to 1 billion children under five years of age from 2015–2020 (Martin-Hurtado 2002). Climate change not accounted for, the sum required over the next 15–20 years to meet the MDG target for ensuring environmental sustainability (MDG 7) is probably between US$60 billion and US$90 billion yearly (Pearce 2005). Comparatively, OECD countries' spending on producer support in agriculture was about US$230 billion in 2000–2002 (Hoekman and others 2002).

For Asia and the Pacific, ADB estimated the annual investment costs required to achieve environmentally sound development based on two scenarios. Under a business-as-usual scenario, the cost would be US$12.9 billion yearly. Under an accelerated progress scenario – one under which developing countries in the region implement the best practices of OECD countries by 2030 – the cost would be US$70.2 billion yearly. A halfway point set between the high and the low estimates would be around US$40 billion yearly (UNESCAP 2001). In addition, repairing the damage done to the land, water, air and living biota was estimated at US$25 billion yearly. Taking into consideration the total financial resources needed and the present level of spending, the financing gap to attain sustainable development in 1997 was about US$30 billion yearly (Rogers and others 1997). Comparatively, military expenditures in the same period (1997) for Central Asia, East Asia and Southeast Asia were estimated at US$120.9 billion (SIPRI 2004).

The cost of inaction

Although there are real costs associated with implementing the measures that will improve the likelihood of successful policy innovation, there are also costs associated with inaction. Both ex-post evaluations of the costs of ignoring warnings as well as scenarios on the costs of global environmental change show that action now is cheaper than waiting for better solutions to emerge. For climate change, for example, our knowledge on the costs of inaction portrays a worrying picture, even while immediate measures are affordable (Stern 2007). Several studies have attempted to measure the effect of the burden of morbidity and mortality due to various environmental causes, in terms of loss of disability adjusted life years (DALYs). Turning DALYs into dollar value produces a global estimate of human capital damage due to environmental causes of over US$2 trillion/year for developing countries alone (Pearce 2005). Using a more conventional income per capita value for developing countries, the total loss of DALYs in the developing world would still be US$200 billion yearly (Pearce 2005). The same studies indicate a significant difference in environmental DALYs in developing relative to developed regions, with the highest cost in developing countries, as a result of greater exposure to environmental damage (Pearce 2005).

Through retrospective analyses of 14 different case studies of the cost of inaction or delayed action to reduce exposure to hazardous agents, the European Environment Agency (EEA 2001) demonstrated that the costs of implementing environmental policy measures are routinely overestimated. As the report indicates, the Netherlands Ministry of Housing and Social Services estimated that the potential benefits of an earlier ban on asbestos in 1965 (compared to the actual ban in 1993) would have saved some 34 000 premature deaths and some US$24 billion in building clean-up and compensation costs. The estimated long-term cost of asbestos to Dutch society was calculated at 56 000 deaths and US$39 billion over the period 1969–2030 (EEA 2001).

All these studies indicate that inaction, delayed action and inappropriate action not only result in higher costs, but unfairly shift the burden of paying for such costs to future generations, in contradiction to the principle of intergenerational equity. Such distributional issues need to be given greater weight in the decision making processes and the estimates of the costs of taking action.

CONCLUSION

Adopting the future policy framework outlined in this report is an opportunity for renewal in the way individuals think about the environment and its impact on their well-being, in the way national decision-makers treat the environmental dimensions of their portfolios, in the way financial resources are mobilized for environmental problems, and in the way the global community organizes itself in the UN system and specialized agencies. Hard to manage, persistent environmental problems will demand complex solutions, and it can be expected that the solutions chosen will, in turn, create new and possibly even more complex problems in their wake. However, the costs of inaction in many of the environmental problems with proven solutions have already become evident. The costs of inaction in dealing with the emerging set of persistent environmental problems are far greater – directly impinging on the future ability of ecosystems to support people.

Therefore, the new environmental policy agenda for the next 20 years and beyond has two tracks:

- expanding and adapting proven policy approaches to the more conventional environmental problems, especially in lagging countries and regions; and
- urgently finding workable solutions for the emerging environmental problems before they reach irreversible turning points.

The latter solutions will generally lie in the "driver" portion of the DPSIR framework used throughout this report. They will strike at the heart of how human societies are structured and relate to nature.

While governments are expected to take the lead, other stakeholders are just as important to ensure success in achieving sustainable development. The need couldn't be more urgent and the time couldn't be more opportune, with our enhanced understanding of the challenges we face, to act now to safeguard our own survival and that of future generations.

References

ADB (2001). *Asian Development Outlook 2001.* Asian Development Bank, Manila

ADB (2005). *Asian Environment Outlook 2005. Making Profits, Protecting Our Planet.* Asian Development Bank, Manila

Aidt, T.S. (1998). Political internalization of economic externalities and environmental policy. In *Journal of Public Economics* 69:1-16

Andersen, M.S., Dengsøe, N. and Pedersen, A.B. (2000). *An Evaluation of the Impacts of Green Taxes in the Nordic Countries.* Centre for Social Research on the Environment, Aarhus University, Aarhus

Andresen, S. (2001). Global Environmental Governance: UN Fragmentation and Co-ordination. In Stokke, O.S. and Thommessen, Ø.B. (eds.) *Yearbook of International Co-operation on Environment and Development.* Earthscan, London

Anheier, H.K., Glasius, M. and Kaldor, M. (eds.) (2001). *Global Civil Society 2001.* Oxford University Press, Oxford

Bass, S. (2006). *Making Poverty Reduction Irreversible: Development Indications of the Millennium Ecosystem Assessment.* International Institute for Environment and Development, London

Beise, M. (2001). *Lead Markets. Country-Specific Success Factors of the Global Diffusion of Innovations.* Physica, Heidelberg

Both ENDS and Gomukh (2005). *River Basin Management; a Negotiated Approach.* Amsterdam and Pune http://www.bothends.org/strategic/RBM-Boek.pdf (last accessed 12 july 2007)

Boykoff, J. and Boykoff, M. (2004). Journalistic Balance as Global Warming Bias: Creating Controversy where Science Finds Consensus. In *Extra!* November/December 2004 http://www.fair.org/index.php?page=1978 (last accessed 12 July 2007)

Brenton, T. (1994). *The Greening of Machiavelli: The Evolution of International Environmental Politics.* Earthscan, London

Cabinet Office (2005). *Regulatory Impact Assessment (RIA) overview.* Department for Business, Enterprise and Regulatory Reform, London http://www.cabinetoffice.gov.uk/regulation/ria/overview/the_ria_process.asp (last accessed 12 July 2007)

Caldwell, L.K. (1996). *International Environmental Policy: From the Twentieth to the Twenty-First Century.* Duke University Press, Durham and London

Canadian Boreal Initiative (2005). *Counting Canada's Natural Capital: Assessing the Real Value of Canada's Boreal Ecosystems.* Canadian Boreal Initiative, Ottawa and Pembina Institute, Drayton Valley

Carius, A., Jacob, K., Jänicke, M. and Hackl, W. (2005). *Evaluation Study on the Implementation of Austria's Sustainable Development Strategy* (in German). Prepared for the Bundesministeriums für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft http://www.nachhaltigkeit.at/strategie/pdf/Evaluationsbericht_NStrat_Langfassung_06-05-11.pdf (last accessed 12 July 2007)

Carter, N. (2001). *The Politics of the Environment: Ideas, Activism, Policy.* Cambridge University Press, Cambridge

CEC (2003). *Reforming the European Union's Sugar Policy: Summary of Impact Assessment Work.* Commission of the European Communities, Brussels

CEC (2004). *Integrating Environmental Considerations into Other Policy Areas: A Stocktaking of the Cardiff Process.* Commission Working Document. Commission of the European Communities, Brussels

CNEDD (2004). *Troisième rapport national du Niger dans le cadre de la mise en œuvre de la Convention internationale de lutte contre la desertification.* République du Niger, Conseil national de l'environnement pour un développement durable., Niamey

Committee on Risk Assessment of Hazardous Air Pollutants, Board on Environmental Studies and Toxicology, Commission on Life Sciences, National Research Council (2004). Science and Judgment in Risk Assessment. In *National Academy Press,* Washington, DC

Costanza, R. and Daly, H. E. (1992). Natural Capital and Sustainable Development. In *Conservation Biology* 6:37-46

Cunningham, N. and P. Grabosky (1998). *Smart Regulation: Designing Environmental Policy.* Clarendon Press, Oxford

Dalal-Clayton, B. and Bass, S. (2002). *Sustainable Development Strategies – A Resource Book.* Earthscan, London

Dalal-Clayton, B. and Bass, S. (2006). *A review of monitoring mechanisms for national sustainable development strategies.* Environmental Planning Series. International Institute for Environment and Development, London

De-Shalit, A. (1995). *Why Posterity Matters: Environmental Policies and Future Generations.* Routledge, London

De-Shalit, A. (2000). *The Environment: Between Practice and Theory.* Oxford University Press, Oxford

Diamond, J. (2005). *Collapse: How Societies Choose to Fail or Succeed.* Viking, New York, NY

Diekmann, A. and Franzen, A. (1999). The Wealth of Nations and Environmental Concern. In *Environment and Behavior* 31(4):540-549

Dietz, T., Ostrom, E. and Stern, P.C. (2003). The Struggle to Govern the Commons. In *Science* 302 (5652):1907-1912

Downs, A. (1972). Up and Down with Ecology – the "Issue-Attention Cycle." In *Public Interest* 28:38-50 http://www.anthonydowns.com/upanddown.htm (last accessed 25 June 2007)

Dupar, M. and Badenoch, N. (2002). *Environment, livelihoods, and local institutions: Decentralisation in mainland Southeast Asia.* World Resources Institute, Washington, DC

Dutzik, T. (2002). *The State of Environmental Enforcement: The Failure of State Governments to Enforce Environmental Protections and Proposals for Reform.* CoPIRG Foundation, Denver

Ecolex (2007). *Ecolex. A gateway to environmental law.* Operated jointly by FAO, IUCN and UNEP http://ecolex.org/index.php (last accessed 12 July 2007)

Eden, S. (1996). Public participation in environmental policy: Considering scientific, counter-scientific and non-scientific contributions. In *Public Understanding of Science* 5 (3):183-204

EEA (2001). *Late lessons from early warnings: the precautionary principle 1896-2000.* Environmental Issue Report No. 22. European Environment Agency, Copenhagen

EEA (2002). *Environmental Signals 2002 - Benchmarking the millennium.* Environmental Assessment Report No. 9. European Environment Agency, Copenhagen

EEA (2004). *Environmental Policy Integration in Europe: Administrative Culture and Practices.* European Environment Agency, Copenhagen

EEA (2005). *The European Environment: State and Outlook 2005.* European Environment Agency, Copenhagen

EEA (2006). *Using the market for cost-effective environmental policy.* EEA Report 1/2006, European Environment Agency, Copenhagen

EEB (2005). *EU Environmental Policy Handbook: A Critical Analysis of EU Environmental Legislation.* European Environment Bureau, Brussels

Ehrlich, P.R. and Ehrlich, A.H. (2004). *One with Nineveh: Politics, Consumption, and the Human Future.* Island Press, Washington, DC

Emerton, L., Bishop, J. and Thomas, L. (2006). *Sustainable Financing of Protected Areas: A global review of challenges and options.* World Conservation Union (IUCN), Gland http://app.iucn.org/dbtw-wpd/edocs/PAG-013.pdf (last accessed 12 July 2007)

Enters, T., Durst, P.B. and Victor, M. (eds.) (2000). *Decentralization and Devolution of Forest Management in Asia and the Pacific.* RECOFTC Report N.18 and RAP Publication 2000/1. Regional Community Forestry Training Centre for Asia and the Pacific, Bangkok

Environmental Assessment Institute (2006). *Getting Proportions Right – How far should EU Impact Assessments go?* Danish Ministry of Environment, Environmental Assessment Institute, Copenhagen http://imv.net.dynamicweb.dk/Default.aspx?ID=674 (last accessed 12 July 2007)

Esty, D. C. and Porter, M. E. (2000). *Measuring National Environmental Performance and Its Determinants. The Global Competitiveness Report 2000:* 60-75. Harvard University and World Economic Forum. Oxford University Press, New York, NY

European Commission (2005). Cost-Benefit Analysis of the Thematic Strategy of Air Pollution. AEAT/ED48763001/Thematic Strategy. Issue 1. AEA Technology Environment for the European Commission, DG Environment, Brussels http://ec.europa.eu/environment/air/cafe/general/pdf/cba_thematic_strategy_0510.pdf (last accessed 12 July 2007)

European Commission (2006). *A guidebook for peer reviews of national sustainable development strategies.* European Commission, DG Environment, Brussels

Farhar, B.C. (1999). *Willingness to Pay for Electricity from Renewable Resources: A Review of Utility Market Research.* US Department of Energy, National Renewable Energy Laboratory, Golden, CO http://www.nrel.gov/docs/fy99osti/26148.pdf (last accessed 12 July 2007)

Ferraro, P.J. and Kiss, A. (2002). Direct Payments to Conserve Biodiversity. In *Science* 298:29

Friends of the Earth (2002). *Marketing the Earth: The World Bank and Sustainable Development.* Halifax Initiative, Ottawa

Furtado, X. (2001). *Decentralisation and Capacity Development: Understanding the Links and the Implications for Programming.* CIDA Policy Branch No. 4. Occasional Paper Series. Canadian International Development Agency, Ottawa

Gelbspan, R. (1997). *The Heat is On: The High Stakes Battle over the Earth's Threatened Climate.* Addison-Wesley, Reading

Giddings, B., Hopwood, B. and O'Brien, G. (2002). Environment, economy and society: fitting them together into sustainable development. In *Sustainable Development* 10(4):187-196

Global Policy Forum (2000). *European Parliament Supports Move to Tax Aircraft Fuel.* European Report. Global Policy Forum, New York, NY http://www.globalpolicy.org/socecon/glotax/aviation/001213ep.htm (last accessed 12 July 2007)

Global Policy Forum (2006). Aviation Taxes. http://www.globalpolicy.org/socecon/glotax/aviation/index.htm (last accessed 12 July 2007)

GRI (2006). Global Reporting Initiative. http://www.globalreporting.org (last accessed 12 July 2007)

Hahn, R.W. and Stavins, R.N. (1992). Economic Incentives for Environmental Protection: Integrating Theory and Practice. In *The American Economic Review* 82 (9):464-468

Hoekman, B., Ng, F. and Olarreaga, M. (2002). *Reducing Agricultural Tariffs versus Domestic Support: What's More Important for Developing Countries?* World Bank Policy Research Working Paper No. 2918. The World Bank Washington, DC

Holling, C.S. (ed.) (1978). *Adaptive Environmental Assessment and Management.* John Wiley and Sons, New York, NY

Hutton, G. and Haller, L. (2004). *Evaluation of the Costs and Benefits of Water and Sanitation Improvements at the Global Level.* WHO/SDE/WSH/04. 04. World Health Organization, Geneva http://www.who.int/water_sanitation_health/en/wsh0404.pdf (last accessed 12 July 2007)

IEA (1999). *World Energy Outlook – Looking at Energy Subsidies, Getting the Prices Right.* International Energy Agency, Paris

IFC (2004). *2004 Sustainability Report.* International Finance Corporation. Washington, DC

Inter Press Service (2005). *France Begins to Tax Flights for Aid.* November 30. http://www.globalpolicy.org/socecon/glotax/aviation/2005/1130paris.htm (last accessed 12 July 2007)

IPCC (1996). *Technologies, Policies and Measures for Mitigating Climate Change.* IPCC Technical Paper No. 1. Intergovernmental Panel on Climate Change, Geneva

IPCC (1999). *Aviation and the Global Atmosphere.* A Special Report of Working Groups I and III of the Intergovernmental Panel on Climate Change, Cambridge

Jacob, K. and Volkery, A. (2004). Institutions and Instruments for Government Self-Regulation: Environmental Policy Integration in a Cross-Country Perspective. In *Journal of Comparative Policy Analysis* 6(3):291-309

Jacob, K., Beise, M., Blazejczak, J. Edler, D., Haum, R., Jänicke, M., Loew, T., Petschow, U. and Rennings, K. (2005). *Lead Markets of Environmental Innovations.* Physica Verlag, Heidelberg and New York, NY

Jacob, K., Hertin, J. and Volkery, A. (2007). Considering environmental aspects in integrated impact assessment : lessons learned and challenges ahead. In George, C. and Kirkpatrick, C. (eds.) *Impact Assessment and Sustainable Development: European Practice and Experience. Impact Assessment for a New Europe and Beyond.* Edward Elgar, Cheltenham

Jaffe, A.B., Newell, R.G. and Stavins, R.N. (2002). Environmental Policy and Technological Change. In *Environmental and Resource Economics* 22(1-2):41-70

Jane Goodall Institute (2006). http://www.janegoodall.org/ (last accessed 25 June 2007)

Jänicke, M. (2006). Trend Setters in Environmental Policy: The Character and Role of Pioneer Countries. In Jänicke, M. and Jacob, K. (eds.) *Environmental Governance in Global Perspective. New Approaches to Ecological Modernisation.*, Freie Universität Berlin, Berlin

Jänicke, M. and Jacob, K. (2004). Lead Markets for Environmental Innovations: A New Role for the Nation State. In *Global Environmental Politics* 4(1):29-46

Jänicke, M. and Volkery, A. (2001). Persistente Probleme des Umweltschutzes. In *Natur und Kultur* 2 (2):45-59

Jordan, A., Wurzel, R.K.W. and Zito, A.R. (eds.) (2003). *"New" Instruments of Environmental Governance? National Experiences and Prospects.* Frank Cass, London and Portland

Jütting J., Kauffmann, C., Mc Donnell. I., Osterrieder, H., Pinaud, N. and Wegner, L. (2004). *Decentralisation and Poverty in Developing Countries: Exploring the Impact.* OECD Development Centre. Working Paper No. 236. August. Organisation for Economic Co-operation and Development, Paris http://www.oecd.org/dataoecd/40/19/33648213.pdf (last accessed 12 July 2007)

Keen, M., Brown, V.A. and Dyball, R. (eds.) (2005). *Social Learning in Environmental Management: Building a Sustainable Future.* Earthscan, London

Kemp, R. and Loorbach, D. (2003). Governance for Sustainability through Transition Management. Paper for the *EAEPE 2003 Conference,* 7-10 November 2003, *Maastricht*

Kemp, R. and Rotmans, J. (2001). The Management of the Co-Evolution of Technical, Environmental and Social Systems. Paper for the *International Conference "Towards Environmental Innovation Systems."* 27-29 September 2001, Garmisch Partenkirchen

Kennedy, R.F. Jr. (2004). *Crimes Against Nature*. Harper Collins, New York, NY

Kiersch, B., Hermans, L. and Van Halsema, G. (2005). Payment Schemes for Water-related Environmental Services: A Financial Mechanism for Natural Resources Management - Experiences from Latin America and the Caribbean. Seminar on *Environmental Services and Financing for the Protection and Sustainable Use of Ecosystems*, 10-11 October 2005, Geneva http://www.unece.org/env/water/meetings/payment_ecosystems/Discpapers/FAO.pdf (last accessed 13 July 2007)

Lafferty, W. B. (2002). *Adapting Government Practice to the Goals of Sustainable Development*. Governance for Sustainable Development. Five OECD Case Studies. Organisation for Economic Co-operation and Development, Paris

Leakey, R. and Lewin, R. (1995). *The Sixth Extinction: Patterns of Life and the Future of Humankind*. Doubleday, New York, NY

Lehman, S.J. and Keigwin, L.D. (1992). Sudden changes in North Atlantic circulation during the last deglaciation. In *Nature* 356:757-762

Lehtonen, M. (2005). OECD Environmental Performance Review Programme. In *Evaluation* 11(2):169-188

Lenschow, A. (ed.) (2002). *Environmental Policy Integration: Greening Sectoral Policies in Europe*. James & James/Earthscan, London

Levy, M.A. (1995). International Cooperation to Combat Acid Rain. *Green Globe Yearbook*, Oxford University Press, Oxford

Loorbach, D. (2002). Transition Management - Governance for Sustainability. Paper presented at the *Conference Governance and Sustainability - New challenges for the state, business and civil society, 31 September - 1 October2002*, Berlin

Lubchenco, J. (1998). Entering the Century of the Environment: A New Social Contract for Science. In *Science* 279:491-497

MA (2003). *Ecosystems and human well-being*. Millennium Ecosystem Assessment. Island Press, Washington, DC

MA (2005). *Ecosystems and Human Well-being: Opportunities and Challenges for Business and Industry*. Millennium Ecosystem Assessment/World Resources Institute, Washington, DC

Martin-Hurtado, R. (2002). *Costing the 7th Millennium Development Goal: Ensuring Environmental Sustainability*. Environment Department, The World Bank, Washington, DC

McKibben, B. (2005). Curitiba: A Global Model for Development http://www.commondreams.org (last accessed 25 June 2007)

Meadows, D.H, Randers, J. and Meadows, D.L. (2004). *Limits to Growth: The 30-Year Update*. Chelsea Green Publishing, White River Junction

Meyer-Krahmer, F. (1999). Was bedeutet Globalisierung für Aufgaben und Handlungsspielräume nationaler Innovationspolitiken? In *Innovationspolitik in globalisierten Arenen*. Opladen, Leske und Budrich

Ministry of Environment Norway (2005). Norwegian Parliamentary Bill No: 1 (2005-2006) of 7th October 2005 from the Ministry of Environment (see Chapter 12 on Waste and Recycling)

MOEJ (2005). *Japan's Experience in the Promotion of the 3Rs: For the Establishment of a Sound Material-Cycle Society*. Global Environment Bureau, Ministry of Environment, Tokyo

Mol, A.P.J. and Sonnenfeld, D.A. (eds.) (2000). Special Issue on Ecological Modernisation. In *Environmental Politics* 9(1)

Myers, N. (1997). Mass Extinction and Evolution. In *Science* 24(5338):597-598

Navarro, Y.K., McNeely, J., Melnick. D., Sears, R.R. and Schmidt-Traub, G. (2005) *Environment and Human Well-Being*. Earthscan, London

NEPP2 (1994). *The National Environmental Policy Plan 2 - The Environment: Today's Touchstone*. Ministry of Housing, Spatial Planning and the Environment, Government of the Netherlands, The Hague

New Economics Foundation (2006). *The UK Interdependence Report: How the World Sustains the Nation's Lifestyles and the Price it Pays*. New Economics Foundation, London

Nielsen, N.O. (1999). The Meaning of Health. In *Ecosystem Health 5(2):65-66*

NRBS (1996). *Report of the Northern Rivers Basin Study*. Northern Rivers Basin Study Board, Edmonton

OECD (2000). *Environmental Performance Reviews (First Cycle): Conclusions and Recommendations, 32 countries (1993-2000)*. Organisation for Economic Co-operation and Development, Paris

OECD (2001a). *Sustainable Development. Critical Issues*. Organisation for Economic Co-operation and Development, Paris

OECD (2001b). *OECD Environmental Performance Reviews (Second Cycle): Norway*. Organisation for Economic Co-operation and Development, Paris

OECD (2002a). *Aggregated Environmental Indices: Review of Aggregation Methodologies in Use*. Organisation for Economic Co-operation and Development, Paris

OECD (2002b). *Policies to Enhance Sustainable Development. Critical Issues*. Organisation for Economic Co-operation and Development, Paris

OECD (2003). Policies to Reduce Greenhouse Gas Emissions in Industry - Successful Approaches and Lessons Learned: Workshop Report, OECD and IEA Information Paper. In *OECD Papers 4(2), Special Issue on Climate Change. Climate Change Policies: Recent Developments and Long-Term Issues*. COM/ENV/EPOC/IEA/SLT(2003)2:322. Organisation for Economic Co-operation and Development, Paris http://www.oecd.org/dataoecd/8/36/31785351.pdf (last accessed 12 July 2007)

OECD (2004). *OECD Environmental Performance Reviews: Canada*. Organisation for Economic Co-operation and Development, Paris

OECD (2006). *Applying Strategic Environmental Assessment: Good Practice Guidance for Development Co-operation*. Organisation for Economic Co-operation and Development, Paris

Oliveira Costa, J.P. De (2005). Protected Areas Ministro de Estado das relações Exteriores, Brasília http://www.mre.gov.br/cdbrasil/itamaraty/web/ingles/meioamb/arprot/apresent/apresent.htm (last accessed 13 July 2007)

PACS (2006). http://www.empowerpoor.org/ (last accessed 13 July 2007)

Pearce, D.W. (ed.) (2004). *Valuing the Environment in Developing Countries: Case Studies*. Edward Elgar, Cheltenham

Pearce, D.W. (2005). *Investing in Environmental Wealth for Poverty Reduction*. United Nations Development Programme, New York, NY http://www.undp.org/pei/pdfs/InvestingEnvironmentalWealthPovertyReduction.pdf (last accessed 25 June 2007)

Petkova, E. and Veit, P. (2000). *Environmental Accountability Beyond the Nation-State: The Implications of the Aarhus Convention*. World Resources Institute, Washington, DC

Petkova, E., Maurer, C., Henninger, N. and Irwin, F. (2002). *Closing the Gap: Information, Participation and Justice in Decision-making for the Environment*. World Resources Institute, Washington, DC

Popper, S.W., Lempert, R.J. and Bankes, S.C. (2005). Shaping the Future. In *Scientific American* 28 March 2005

Porter, M. E. and Van der Linde, C. (1995). Toward a New Conception of the Environment-Competitiveness Relationship. In *Journal of Economic Perspectives* 9:97-118

Posner, R.A. (2005). *Catastrophe: Risk and Response*. Oxford University Press, Oxford

Rees, M. (2003). *Our Final Hour: A Scientist's Warning: How Terror, Error, and Environmental Disaster Threaten Humankind's Future in this Century-On Earth and Beyond*. Basic Books, New York, NY

Rogers, P., Jalal, K.F., Lohani, B.N., Owens, G.M., Yu, C., Dufournaud, C.M. and Bi, J. (1997). *Measuring Environmental Quality in Asia*. Harvard University and Asian Development Bank, Cambridge

Rotmans, J., Kemp, R. and Van Asselt, M. (2001). More Evolution than Revolution - Transition Management in Public Policy. In *Foresight 3(1):15-31*

SEI (2004). *Ecological Sanitation: Revised and Enlarged Edition*. Stockholm Environment Institute, Stockholm

Shortle, J.S., Abler, D.G. and Horan, R.D. (1998). Research Issues in Nonpoint Pollution Control. In *Environmental and Resource Economics* 11(3-4):571-585

SIPRI (2004). *World and regional military expenditure estimates 1988 – 2006*. Stockholm International Peace Research Institute, Stockholm http://web.sipri.org/contents/milap/milex/mex_wnr_table.html (last accessed 13 July 2007)

Speth, J.G. (2004). *Red Sky at Morning: America and the Crisis of the Global Environment*. Yale University Press, New Haven and London

Stanley Foundation (2004). *Development, Poverty and Security – Issues before the UN's High Level Panel*. http://www.stanleyfoundation.org/publications/report/UNHLP04d.pdf (last accessed 12 July 2007)

Steid, D. and Meijers, E. (2004). Policy integration in practice: some experiences of integrating transport, land-use planning and environmental policies in local government. *Berlin Conference on the Human Dimensions of Global Environmental Change: Greening of Policies – Interlinkages and Policy Integration*, 3-4 December 2004, Berlin

Stern, N. (2007). *The Economics of Climate Change: The Stern Review*. Cambridge University Press, Cambridge

Steurer, R. and Martinuzzi, A. (2005). Towards a New Pattern of Strategy Formation in the Public Sector: First Experiences with National Strategies for Sustainable Development in Europe. In *Environment and Planning C: Government and Policy* 23(3):455-472

Stinchcombe, K. and Gibson, R.B. (2001). Strategic Environmental Assessment as a Means of Pursuing Sustainability: Ten Advantages and Ten Challenges. In *Journal of Environmental Assessment Policy and Management* 3(3):343-372

Swanson, D., Pintér, L., Bregha, F., Volkery, A. and Jacob, K. (2004). *National Strategies for Sustainable Development: Challenges, Approaches and Innovations in Strategic and Coordinated Action*. International Institute for Sustainable Development, Winnipeg, and Deutsche Gesselschaft für Technische Zusammenarbeit (GTZ) GmbH, Eschborn

Tews, K., Busch, P.-O. and Jörgens, H. (2003). The diffusion of new environmental policy instruments. In *European Journal of Political Research* 42(4):569-600

TFL (2004). *Congestion Charging: Update on Scheme Impacts and Operations*. Transport for London, London

UCS (1992). World Scientists' Warning to Humanity (1992). Scientist Statement. Union of Concerned Scientists http://www.ucsusa.org/ucs/about/1992-world-scientists-warning-to-humanity.html (last accessed 13 July 2007)

UN (2002a). *World Summit on Sustainable Development, Johannesburg Plan of Implementation*. United Nations, New York, NY http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/POIToc.htm (last accessed 13 July 2007)

UN (2002b). *Report of the International Conference on Financing for Development*. Monterrey, 18-22 March 2002. United Nations VA/CONF.198/11. United Nations, New York, NY

UN (2005a). *Summary by the President of the Economic and Social Council of the Special High-level Meeting of the Council with the Bretton Woods institutions, the World Trade Organization and the United Nations Conference on Trade and Development*. New York, 18 April 2005. A/59/823–E/2005/69. United Nations, New York, NY

UN (2005b). *Summary by the President of the General Assembly of the High-level Dialogue on Financing for Development*. 27-28 June 2005. A/60/219. United Nations, New York, NY

UN (2005c). Address by H. Exc. Mr. Thierry Breton Minister for the Economy, Finance and Industry of France at the *High-level Dialogue on Financing for Development of the General Assembly*, 27 June 2005. United Nations, New York, NY http://www.un.int/france/documents_anglais/050627_ag_financement_developpement_tbreton.htm (last accessed 13 July 2007)

UN (2005d). *In Larger Freedom: Towards Development, Security and Human Rights for All*. United Nations, New York, NY http://www.un.org/largerfreedom/executivesummary.pdf (last accessed 13 July 2007)

UNCED (1992). *Agenda 21 - The United Nations Programme of Action from Rio*. United Nations Conference on Environment and Development, New York, NY

UNCTAD (2005). Statement by Carlos Fortin, Officer-in-Charge of the United Nations Conference on Trade and Development (2004-2005) at the *High-level Dialogue on Financing for Development of the General Assembly*, 27 June 2005. United Nations, New York, NY http://www.unctad.org/Templates/webflyer.asp?docid=6006&intItemID=3551&lang=1 (last accessed 13 July 2007)

UNDP (2002). *Human Development Report 2002: Deepening democracy in a fragmented world*. United Nations Development Programme, New York, NY

UNDP (2005). *Environmental Sustainability in 100 Millennium Development Goals Country Reports*. http://www.unep.org/dec/docs/UNDP_review_of_Environmental_Sustainability.doc (last accessed 13 July 2007)

UNECE (2005). *Synthesis Report on the Status of Implementation of the Convention*. Meeting of the Parties to the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, ECE/MP.PP/2005/18, 12 April. United Nations Economic Commission for Europe, Geneva http://www.unece.org/env/pp/reports%20implementation.htm (last accessed 12 July 2007)

UNECE (2007). Convention on Long-range Transboundary Air Pollution (CLRTAP). http://www.unece.org/env/lrtap/ (last accessed 12 July 2007)

UNEP (2006a). *GEO Year Book 2006*. United Nations Environment Programme, Nairobi

UNEP (2006b). *Marine and coastal ecosystems and human well-being: A synthesis report based on the findings of the Millennium Ecosystem Assessment*. United Nations Environment Programme, Nairobi

UNEP (2006c). *Rural Energy Enterprise Development (REED)*. United Nations Environment Programme, Paris http://www.uneptie.org/energy/projects/REED/REED_index.htm (last accessed 13 July 2007)

UNEP (2006d). *Principles for Responsible Investment: An investor initiative in partnership with UNEP Finance Initiative and the UN Global Compact* http://www.unpri.org/files/pri.pdf (last accessed 11 July 2007)

UNEP and LSE (2005). Creating Pro-Poor Markets for Ecosystem Services. Concept Note for the *High-Level Brainstorming Workshop "Creating Pro-Poor Markets for Ecosystem Services,"* 10–12 October 2005. United Nations Environment Programme and London School of Economics, London

UNESCAP (2001). *Regional Platform on Sustainable Development for Asia and the Pacific, 3rd Revision.* United Nations Economic and Social Commission for Asia and the Pacific, Phnom Penh

UNESCO (2005a). *"Scaling Up" Good Practices in Girls' Education.* United Nations Educational, Scientific and Cultural Organization, Paris

UNESCO (2005b). *UN Decade of Education for Sustainable Development: Links Between the Global Initiatives in Education.* Technical Paper No. 1. United Nations Educational, Scientific and Cultural Organization, Paris

UNGA (1972). *General Assembly resolution 2997.* United Nations, New York, NY

UNIDO (2000). *Cluster Development and Promotion of Business Development Services (BDS): UNIDO's experience in India.* PSD Technical working papers series Supporting Private industry. United Nations Industrial Development Organization, Vienna http://www.unido.org/en/doc/4809 (last accessed 25 June 2007)

UNITAID (2006). *UNITAID Basic Facts – UNITAID at work.* http://www.unitaid.eu/en/(last accessed 13 June 2007)

USDA (2001). *FI 2001Budget Summary of the. United States Department of Agriculture* http://www.usda.gov/agency/obpa/Budget-Summary/2001/text.htm (last accessed 13 July 2007)

Volkery, A., Swanson, D., Jacob, K., Bregha F. and Pintér L. (2006). Coordination, Challenges and Innovations in 19 National Sustainable Development Strategies. In *World Development* (accepted for publication)

Von Weizsäcker, E.U. and Jesinghaus, J. (1992). *Ecological Tax Reform. A Policy Proposal for Sustainable Development.* Zed Books, London

Wachter, D. (2005). Sustainability Assessment in Switzerland: From Theory to Practice. *EASY-ECHO 2005-2007, First Conference,* Manchester http://www.sustainability.at/easy/?k=conferences&s=manchesterproceedings

Walker, B., Holling, C.S., Carpenter, S.R. and Kinzig, A. (2004). Resilience, adaptability and transformability in social-ecological systems. In *Ecology and Society* 9(2):5

Wates, J. (2005). The Aarhus Convention: a Driving Force for Environmental Democracy. In *JEEPL* (1):2-11.

WCED (1987). *Our Common Future.* World Commission on Environment and Development, Oxford University Press, Oxford

Wiedman, T., Minx, J., Barrett, J. and Wackernagel, M. (2006). Allocating ecological footprints to final consumption categories with input-output analysis. In *Ecological Economics* 56(1):28-48

Wilkinson, D. (1997). Towards sustainability in the European Union? Steps within the European Commission towards integrating the environment into other European Union policy sectors. In *Environmental Politics* 6(1):153-173

Wilkinson, D., Fergusson, M., Bowyer, D., Brown, J., Ladefoged, A., Mokhouse, C. and Zdanowicz, A. (2004). *Sustainable Development in the European Commission's Integrated Impact Assessments for 2003.* Institute for European Environmental Policy, London http://www.ieep.org.uk/publications/pdfs//2004/sustainabledevelopmentineucommission.pdf (last accessed 13 July 2007)

Wilson, E.O. (1996). *In Search of Nature.* Island Press, Washington

Work, R. (undated). *The Role of Participation and Partnership in Decentralised Governance: A Brief Synthesis of Policy Lessons and Recommendations of Nine Country Case Studies on Service Delivery for the Poor.* UNDP-MIT Global Research Programme on Decentralised Governance. United Nations Development Programme, New York, NY

World Bank (1997). *World Development Report 1997: The State in a Changing World.* The World Bank, Washington, DC

World Bank (2005). *Integrating Environmental Considerations into Policy Formulation: Lessons from Policy-based SEA Experience.* The World Bank, Washington, DC

World Bank (2006). *Where is the Wealth of Nations: Measuring Capital for the 21st Century.* The World Bank, Washington, DC

Worldwatch Institute (2004). *State of the World 2004: Consumption by the Numbers.* Worldwatch Institute, Washington, DC

WTO (2001). Ministerial declaration of the *World Trade Organization Ministerial Conference Fourth Session,* 9-14 November 2001, Doha. WT/MIN(01)/DEC/1 http://www.wto.org/english/thewto_e/minist_e/min01_e/mindecl_e.doc (last accessed 13 July 2007)

Yuan, Z., Bi, J. and Moriguichi, Y. (2006). The Circular Economy: A New Development Strategy in China. In *Journal of Industrial Ecology* 10(1-2):4-8